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Losing One's Temper: Contingency in Early Modern Medicine

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Abstract:

How scientific knowledge relates to medical practice is not always straightforward. On the one hand, natural philosophers deal with the universal, with what is true regardless of all circumstances; on the other hand, physicians struggle with the immediate and pressing needs of the individual patient. Yet, in Galenic medicine there were three ways of dealing with various forms of life: the notion of temperament, a fluid understanding of disease, and a rigid method of semiotics. These three fields were interconnected; the contingencies of one were the foundations of another. Together, they bridged the gap between the universe and the patient, taming the four primary qualities of the material world for use in medical practice. Indeed, they also took on a moral dimension, providing rules of conduct to help physicians face the unknown.

So when Galenic medicine fell in the seventeenth century, the delicate union between knowledge and practice fell with it. Through the works of William Harvey (1578-1657), Richard Lower (1631-1691) and John Locke (1632-1704), this chapter examines how each one of these Galenic connections was questioned and replaced with an understanding consistent with the new experimental philosophy. However, as the works of Friedrich Hoffman (1660-1742) illustrate, this did not create a more rational medicine – in fact, the opposite. More rigorous philosophical standards only led to a proliferation of sometimes contradictory medical theories; the practicing physician left with no means to decide between them. Contingency was still central to medicine but hidden from view.

Main text:

'Medicine is a science of uncertainty and an art of probability.'

- Sir William Osler[1]

That medicine must deal with contingencies is perhaps a truism that barely requires scholarly attention. Indeed, the problem of contingency in medicine becomes even more striking when it is compared with the sciences. After all, scientists make claims to universal, timeless knowledge; physicians have to keep people alive. But as the above epigram from the early twentieth-century medical professor William Osler shows, it is these relations between science and medicine through which contingency manifests itself, indicating what is unknown and uncertain. Medical knowledge, straddling both science and art, must be used by the physician both learned and wise, for the patient who may be incessantly aware of their own mortality. But this is the modern view of contingency and medicine; it is by no means the universal view. How physicians have attempted to manage contingency – whether to cage it, militate against it, or simply to ignore it – has changed throughout history. This chapter examines the changing relationship between contingency and medicine in the

[1] William Bean (ed.) *Sir William Osler: Aphorisms from his Bedside Teachings and Writings* (New York: Schuman, 1950): 129.

early modern period, from the 1620s to the 1690s, from the late Renaissance through the Scientific Revolution to the cusp of the Enlightenment.

Yet, even these are loaded terms which require clarification. As many historians have noted in response to the works of Alexandre Koyré, Herbert Butterfield and A. Rupert Hall, there was no singular 'Scientific Revolution' in which tradition was replaced with modernity, magic with science, veneration of the ancient authorities with scepticism.[2] Great change occurred with great continuities. Indeed, what constituted knowledge was one of the questions asked during the seventeenth century: a large variety of investigators, collectors, thinkers and practitioners who claimed scientific status for their disciplines, and in turn shaping what it meant to be a science at all.[3] But as the historian Peter Dear has described, it is here that a definite trend can be detected. Over the course of the seventeenth century, what was considered philosophical knowledge began with an Aristotelian understanding – of underlying essences, of material, formal, efficient and final causes – and slowly became an understanding of the universe based upon descriptions of outward appearances, where possible actual measurements were coupled with tentative suggestions of efficient causes.[4] In short, Aristotelian *scientia* was transformed into the 'new science.'

The problems we encounter when thinking about science in the seventeenth century only intensify when we turn to medicine. Indeed, as these problems seem insurmountable in medicine, many consider it to be no science at all. The historians Lester S. King and Roger French decry the stubborn insistence of seventeenth-century physicians who held on to their theories, remedies and practices even when Harvey's discovery of the circulation of the blood had rendered them obsolete: denial meant that there was no revolution for medicine.[5] Thomas Broman has noted that by the eighteenth century, medicine was a vastly different enterprise from natural philosophy.[6] But such sentiments were commonplace even before the seventeenth century. As many historians have noted, the status of medicine as either *scientia* or *techne*, a craft, had been a long-standing debate.[7] Indeed, early modern dismissals of medicine as a mere mechanical art were frequently also smears against the reputation of the medical community. Physicians were regarded as quarrelsome, unskilled, unprincipled, greedy materialists and atheists, more familiar with rhetoric than with results.[8] Attempts by medical thinkers to demonstrate that their field was a science, therefore, were also ethical arguments, declarations of their virtue. But as we shall see, what visions they created of their moral authority – what other professions physicians were asked to emulate – also reflected how such thinkers believed their discipline related to the uncertain and the unknown, in other words, to contingency.

But whatever attempt physicians made to claim the dignity of their profession was also marred by the sheer number of different medical sects which competed against each other in the seventeenth century: matters which were exacerbated by a lack of political will to prosecute unlicensed medical practitioners, as well as the increasingly varied attacks on Aristotelian and Galenic philosophy.[9]

[2] See, for example, Biagioli (1998).
[3] See Gaukroger (2006), Shapin (1996), Schribner (1993).
[4] Dear (1995).
[5] King (1970), French (2003). See also Cook (2010).
[6] Broman (2003).
[7] See, for example, Maclean *(*2002, 68-100), Wear (2000), Siraisi (1997).
[8] See Park (1985, 225-36).
[9] See, for example, Cook (1987, 61-77), Webster (1976).

Indeed, what could even be considered Galenic medicine at this time is an open question. By the seventeenth century, Galenic physicians had inherited a tradition of several hundred years of translation and transmission, commentary and criticism, through the Eastern Roman Empire, Arab scholars, and finally through the Latin West.[10] Depending upon the tradition of interpretation, physicians could hold contradictory points of view and still be considered Galenic.

This chapter, therefore, examines only two authors who tried to establish medicine's scientific and moral authority amidst the changes which were occurring within natural philosophy: Lazare Rivière (1589-1655) and Friedrich Hoffmann (1660-1742).[11] While not contemporaries, both attempted to establish the credentials of medicine by considering three aspects in particular. First was the notion of constitution or temperament: the unique configuration of body and mind which gives each person their individuality and which influences their susceptibility to certain diseases and the success of any medical treatment. Second is the notion of disease: its seat, causes and effects, and how to distinguish between them. Third was the art of bringing this knowledge to bear in practice: to recognise the marks of disease in the individual patient as the first step in their medical treatment, or, in other words, semiotics. But, as this chapter shows, while both Rivière and Hoffmann considered temperament, disease and semiotics when composing their medical textbooks, they had very different views of each and, indeed, what constituted medicine. What influenced such different understandings were the works of the other thinkers examined in this chapter: William Harvey (1578-1657), Richard Lower (1631-1691) and John Locke (1632-1704).[12] Through their efforts, the seventeenth century saw new notions of the body and the universe, new concepts of disease and therapeutics, new ways in which to be a physician, and new attitudes to contingency. Yet, by the end of the seventeenth and into the eighteenth century, Rivière's work sat alongside Hoffmann's on the bookshelf of many learned physicians.[13] There was no scientific revolution in medicine. The concluding remarks of this chapter put forward a reason why this was so.

A Galenic Body

When Rivière, Professor of Physic at the University of Montpellier, gave the lectures which would published in English as *The Universal Body of Physick* in 1657, he began by declaring that medicine was more a *scientia* than a *techne*. After all, the four primary elements of the universe given in Aristotle's *De Generatione et Corruptione* – earth, air, fire and water – could be seen in the natural evacuations of the body: in earthy stools, in watery sweat and urine, in airy and fiery evaporates.[14] Indeed, even when cooked by the heat of the liver and transformed into melancholy, phlegm, blood and choler respectively, their presence could still be found in the body, both inside and out. Examining the internal organs, Rivière found: 'the substance of the milt [spleen] is very like the

[10] On the history of Galenic thought, see Temkin (1973), Nutton (1979).
[11] On Rivière's life and influence, see Brockliss & Jones (1997). On Hoffmann, see French (1990, 88-110), King (1970, 181-204).
[12] On Harvey, see French (1994), Bylebyl (1979). On Richard Lower, one of the first to transfuse animal blood into a human and assistant to Thomas Willis, see Frank (1997, 65-110). While historians of medicine have traditionally considered Thomas Sydenham the father of modern medicine and the 'English Hippocrates,' Peter Anstey and John Burrows have shown that Sydenham's most influential works, and therefore his reputation, belong to John Locke. See Anstey (2011), Anstey & Burrows (2009).
[13] On the translation and transmission of Rivière's work, see Leong, (forthcoming). My thanks to Elaine for giving me an advance copy of this work.
[14] Rivière, (1657, 4).

melancholick humor: of the Lungs resembling the bilious humor: of the Liver the Sanguin [sic], of the brain the pituitous.'[15] From outside the body, this mixture of organs with their unique configuration of humours became a prevalence of one or two humours over the others, which could be seen in the very nature of individuals themselves. A predominance of humoural blood, Rivière wrote,

> is usefull for the nutrition of carnous parts, as of the muscles and bowels which are nourished by blood properly so called. The effect of it is to raise in men hilarity and mirth, a propensity to sports and love, and flourishes them with a lovely colour; because they are well fraught with temperate heat, which is the original of these merry frolicks. As we may take notice that all creatures in the cradle of their Age, are much addicted to hilarity, because that is the furnace of natural heat.[16]

This was the nature of temperament: the balance of humours which constituted the individual in their natural state. The physician could determine, simply by the touch of his hand, which of the eight combinations a particular individual possessed. Medicine was more than an art, even though its purpose was the health of the patient, because it revealed the nature of man and man in nature: temperament was affected by climate and age, season and sex. For Rivière, merely contemplating the natural world was subordinate to this more ultimate end.

However, matters were more complicated than this. As mentioned above, a *scientia* required knowledge of essences and causes. For medicine to achieve this required the existence of a ninth temperament – Eucrasy – the 'perfect temperament' in which the four qualities were equally 'fixed to a due Mediocrity.' However, for Rivière such a well-proportioned temperament could not exist in Nature: eucrasy was an ideal, or a fiction. Yet, it was also a necessary ideal, a measure with which the other temperaments could be compared, indicating how the vast array of individual temperaments could be put into order, just 'As *Plato* hath modelled such a perfect Common-Wealth, *Cicero* such a perfect Orator, and the Stoicks such a perfect sage, as never were in being.'[17] Nevertheless, this was a measure that contained within it an aspiration, one which could never be fulfilled: even the person in health, in which the humours had found their natural balance, was still imbalanced compared with the Eucrastic. The natural state of humanity lay in in the shadows of this hypothetical, perfect self.

But even though a universal body did not exist, this did not mean that all hope of a science of humankind was lost with it. Matter was variable, changeable; the material causes of health relied on an unknowable, capricious Nature. But more enduring were the functions of the body, for although each person was completely individual, the proper functioning of the body – or in other words, the 'substantial form' of the body, the origin of all living actions, or the soul – was not. Thus the whims of matter and the fragility of health cancelled each other out; these were the foundations on which a *scientia* of the body could be built. Indeed, as the soul was also immaterial for Rivière the entire organisation of the body was the means for the soul to express itself: the soul operated 'through the help of divers vertues and proprieties, which are the immediate retainers to its Essence, and immediately depend upon it, and these proprieties are termed faculties.'[18] This was a hierarchical

[15] Ibid., 20.
[16] Ibid., 21.
[17] Ibid, 12-13.
[18] Ibid., 44.

structure, staggeringly thorough and each scrupulously defined: the natural, vital and animal faculties blossomed into a variety of other, more specific faculties, harbouring within them a range of different functions such as the making of chyle and blood, as bodily heat and the heartbeat, as sense and movement, as the understanding and life itself.[19] Within Rivière's understanding of the body, faculty and function could only ever exist in tandem. Faculty was the potential for function; function was the success of faculty. No part operated independently from any other part, each function was a link within a chain of causal relations from the soul to the skin. A fiefdom set across the entirety of the body.

Thus, for Rivière there could still be a *scientia* of the body, even though he considered each faculty could only be a 'proper and inseparable accident' of the soul.[20] Although the notion of a perfect temperament was fictitious – and thus, there could be no universal essence of mankind – there were still universal laws to which the body was subject and therefore accessible to our understanding. Problems only arose when these laws were transgressed or, in other words, when the body was diseased. As Rivière described in the opening to the pathology section of his work:

> *Nature* is *twofold*, according to the Philosophers, universal and particular. The laws of universal nature require generation, corruption, and various alteration, to be strictly observed in bodies, which are therefore obedient to the dictates of this universal nature; but particular nature, *viz*. humane, hath enacted laws proper to the constitution of her own Republick, differing from the laws of universal nature, which if they be cancelled, a man is then thought to decline from nature, *viz*. particular nature. So a certain harmony of first qualities constitute Mans body, together with a due conformation and adunation of the parts: in which, when there happens any distraction, a body becomes preternatural, as shall be at large expounded in the following Treatise.[21]

When disease struck, the great web of bodily obligations that constituted health broke with it. After all, disease was an aberration of a normally functioning individual, a deviation of a deviation. However, this did not mean that disease was outside the realms of medical knowledge, merely the boundaries of physiology. For Rivière, pathology was the complement of physiology since disease was merely the shadow of health: body part, temper and function; disease, cause and symptom. Hence, within Rivière's pathological section disease had its own definition:

> Disease is defined by a Diathesis or disposition which term signifies to us a certain position of its essence or parts, or constancy in the body … And this constancy is called permanency, viz., a disposition so stamp'd upon the part, that its essence is different and separate from the cause producing it, an independent on it.[22]

To be considered a disease, Rivière believed an affliction needed to fulfil three criteria. First, that it indisposed a part of the body; second, for long enough to produce symptoms in the body; and third, that these symptoms were severe enough for the patient to notice.[23] With these criteria Rivière arranged disease into genera and species, counting eight diseases – one each for the temperaments

[19] Ibid., 46-55.
[20] Ibid., 44.
[21] Ibid., 67.
[22] Ibid., 70.
[23] Ibid., 73-76.

– and four species that affected the organs: problems of conformation [shape], magnitude, number and conjunction.[24] In other words, just as the bodies had their own essences and accidentals, so too did disease: both could equally be considered *scientia*.

But just as in the body, some accidentals were more important for medical practice than its essence, in disease there were genera of accidentals which were more useful to the physician. For Rivière, there were four: the severity of the symptoms, the duration of the disease itself, and finally whether there was any threat to the patient's life.[25] But there were two other types of accident, not so much important for the health and recovery of the patient but for bolstering the physician's reputation. The first was when a disease transformed into another, as 'when the Apoplexy makes a transition into a Palsie, a Tertian feaver [sic] in a Quartan; a quartan, the swelling of the liver or spleen, and many other affections turn their stream, and run into the channel of a Dropsie.'[26] The second was the moment of crisis – the last attempt by the body to remove the 'morbifick matter' – which signalled a great change in the patient either towards perfect health or towards death.[27] Yet while it was critical for the physician to detect these signs – and thereby decide whether to stand one's reputation on a successful cure – determining the moment of crisis was one of the most difficult of the physician's tasks. It required the physician to consider, amongst other things, the condition of the body's 'expulsive faculty', the time of year and time of life when the patient became ill, and how the moon influenced the humours of the body.[28] It required the physician to detect signs which would eventually lead to both a diagnosis and a prognosis. In short, it required the art of semiotics.[29]

Yet there was nothing particularly mystical about semiotics, even if from the patient's point of view it seemed a form of divination. For Rivière, a sign was that 'which being obvious to the senses, signifies something lurking in ambush within the veil of our body.'[30] Moreover, there were myriad signs which the physician could draw upon: the semiotics was the largest section of Rivière's work. Each accidental of the human body found its counterpart in semiotics. Phlegmatics were created by 'A customary feeding on meats, cold and moist, as fruits, hearbs [sic], meats made of milk, drinking of water, &c, for they are transmuted into flegme.'[31] They 'are subject to cold diseases, as catarrhs, dropsies, pituitous distempers, lethargies, palsies, and the like.'[32] Sanguines 'dream of red things, of mirth, pleasantness, marriages, gardens, musical notes, Kings, Princes and Nobles,' but they were also prone to 'an easy toleration of venery, by reason of the copiousness of seminal matter.'[33] Bilious men were more common in summer, in hot and dry regions, or in those who have led a laborious life, and they 'have a propensity which disposeth them for diseases, as burning feavers, and tortious, phrensy, and pleurisy; to bilious vomits, *Diarrhea's*, [sic] Erysipela's, blisters, and pimples in the face, &c.'[34] Melancholics possess 'A skin to the touch cold, dry, hard, and rough,' narrow veins, were known as spitters for the quantity of their saliva, and suffered 'A frequent invasion of Melancholic

[24] Ibid., 76.
[25] Ibid., 81-82.
[26] Ibid., 85.
[27] Ibid., 86.
[28] Ibid., 99. On seventeenth-century understandings of microcosm-macrocosm, see Norford (1977).
[29] On early modern semiotics, see Maclean (2002), Wear (1995, 151-74).
[30] Rivière (1657, 116).
[31] Ibid., 121.
[32] Ibid., 122.
[33] Ibid., 123.
[34] Ibid., 120.

diseases, such as the Quartans, swelling of the Milt, and hardness; the Leprosie, loathsome scabs, corrupt blood, and the haemorrhoids, &c.'[35] The most severe of diseases declared 'A Colour of the body very red, yellow, or pale; a tast[e] bitter in the tongue, the colour thereof black, and much driness [sic].'[36] Diseases caused by an overabundance of blood or yellow choler tended to last longer than those from melancholy and black choler, and come with additional signs: 'Excrements expelled with a great noise, signify the longitude of the disease. So spittle excluded by a troublesome roke, because it argues much difficulty, speakes longitude.'[37] Malignant diseases such as cancer, leprosy, venereal disease, carbuncles and plague would be revealed 'If by vomit, the belly, or urine, excrements pale, black, eruginous [copper-like], or tainted with some alien quality remote from the natural be expelled.'[38] Rivière's description of the signs of crisis ran to sixty pages, and included such advice as 'Those who are taken with a Tetanus, dy [sic] within four dayes, but if they escape in them, they recover;'[39] 'Pains descending from the superior to the inferior parts, are healthy. For they shew that the morbifick matter is conveyed away from the principal to the more ignoble parts,'[40] and

> In the inflammation of the liver a Critical flux is healthy, but with the caution, that evacuation be made through the right nostril: for if it proceed through the left, it will not regulate it self … and it will shew that nature upon a perturbation operates preposterously.[41]

The moment of crisis, whose divination was the most important part of medical practice, could be predicted with the accuracy of an hour, especially since 'the approch [sic] of the Crisis is easily known from the perturbation that precedes it; for when the combate between nature and the disease begins, then the symptoms are chiefly exasperated.'[42] Rivière even noted the signs that frequently announced insanity: 'forgetfulneβ presently happening in acute diseases fortells a phrensie', and 'white and clear urines in acute diseases are manifest signs of madneβ. For they signifie that the choler that went to be poured out with the urine, and to give a colour to it, is transferred to the brain.'[43] In semiotics were combined the precepts of physiology and pathology – the universe found in the individual – not only giving credence to the physician's deductions, but also helping to guide medical practice throughout the clinical encounter, from the first consultation until death. This was why medicine should be considered more a *scientia* than an art.

Moreover, since medicine was a *scientia*, Rivière continued, physicians did not deserve the accusations of inconsistency and contradiction; of audacity and greed; or of lowly, immoral and lethal behaviour which had been levelled against them. He resented the comparison made between physicians and artisans, and suggested another profession with which physicians should be associated and whose practices they should emulate. Describing how a physician divines the moment of crisis, Rivière turned to the words of Galen:

[35] Ibid., 124.
[36] Ibid., 134.
[37] Ibid., 146.
[38] Ibid., 136.
[39] Ibid., 149.
[40] Ibid., 158.
[41] Ibid., 175.
[42] Ibid., 208.
[43] Ibid., 215-16.

> All these things are transacted before a judge, who weighs them all, and at last in a certain time gives judgement of the whole matter. In the same manner in the Crisis the disease represents him that brings the action, nature the person guilty, the morbifick cause brings nature into the Court, endeavouring to overthrow it; of this invasion the symptoms are witnesses, which declare the whole progress of the contention. But nature, which is as it were in the capacity of a guilty person, defends it self stoutly against its adversary disease, whose resistance, if she be well fortified, she baffles, and turns him off as an unjust Plaintiff, and thrusts him out of Court; but if she want good supports, she must submit to the fury of her Antagonist. All these things are points of accurate inspection to a Physician; who after a serious pensitation [consideration] of the strength of both parts, gives sentence as a Judge, and designs that day of judgement in which either the disease or nature shall be cast.

While Rivière considered this portrayal not 'wholly absurd and contemptible,'[44] for our purposes the comparison is striking for how it relates to contingency. A judge must deal with the unknown and the uncertain on a regular basis, but has the tools with which to alleviate – if not completely abolish – doubt. Theirs were the best decisions, made with the most complete evidence to hand. Similarly for Rivière, contingency was a recognised part of Galenic medicine whose burdens could be assuaged. The accidentals of one *scientia* were the essences or universal laws of another: contingencies of temperament were resolved by examining faculty and function, disorders of which could be studied as disease, and their signs could be read across the individual's body. The reason why Rivière's *Universal Body of Physick* remained popular long into the eighteenth century, this brief sketch suggests, is that Rivière conceived of medicine as this series of overlapping *scientia* – from the elemental qualities of the universe to the individual patient – that integrated medical theory with medical practice, to the benefit of both physician and patient.

Harvey

However, it was also precisely these means of dealing with contingency that were thrown into doubt over the course of the next forty years. Yet this was not always intentional. When in 1628 William Harvey published his *De Motu Cordis*, thereby demonstrating the circulation of the blood rather than its Galenic ebb and flow, he tore down more than 1500 years of medical theory. The great irony of Harvey's life is that he was an Aristotelian,[45] attempting to replace Galen's *De usu partium corporis humani* – the foundation of renaissance anatomical texts, which Harvey had encountered when studying in Padua – with Aristotle's *De generatione et corruptione*.[46] But ultimately, Harvey's research threw both into doubt. By 1649, Harvey was aware that his work on the circulation of the blood was being used by philosophers such as Descartes to argue for a mechanical universe. His *Exercitationes de generatione animalium* (1651) was therefore an attempt to restore as much Aristotelian philosophy as possible. As we shall see, this was just as successful as Harvey's previous venture.

Generation was a subject of greater significance than the heart, Harvey explained, since

[44] Ibid., 86.
[45] See Pagel (1967), Pagel (1969).
[46] On Renaissance anatomy, see Sawday (1995), Carlino (1999). On the medical curriculum in Padua during Harvey's studies, Bylebyl (1979).

> whatever is first formed or exists primarily in generation, is the material cause of everything that succeeds. For example, before a man attains to maturity, he was a body, an infant, an embryo. And then it is indispensable to inquire further as to what he was in his mother's womb before he was an embryo or foetus; whether made up of three bubbles, or a shapeless mass, or a conception or coagulum proceeding from the mingled seminal fluids of his parents, or what else, as we have it delivered to us by writers.[47]

Whatever interpretation could be given to the circulation of the blood or to heartbeat – however materialistic or atheistic – an account of its origins that relied on non-mechanical principles would trump it. Indeed, this perhaps explains Harvey's disapproval of Hieronymus Fabricius' work on animal generation. Fabricius was guilty, according to Harvey, of 'quitting the evidences of sense that rest on anatomy, he seeks refuge in reasonings upon mechanical principles.' For Harvey, this was a betrayal of the anatomist's duties and an insult to God's 'inimitable providence and intelligence.' Harvey's research was to begin with the humble chicken, but his findings were to encompass more complex animals such as dogs, cats, oxen and deer, up to the most perfect of animals: humans. The generation of a single species of animal was important: through analogy, one could also study

> the order and economy of generation, as observed by us; that from thence, from its own work, we may have some certain information of the several faculties of the formative and vegetative soul, and of the nature of the soul itself, judging from its members or organs, and their functions.[48]

Harvey's experiments may have been simply anatomical, but through them he searched for answers to the deepest physiological concerns, to reinforce the living obligation between faculty and function, and to remake the animal world as a reflection of theological truth. Nature 'perfect and divine' would show her agency in the diverse genera and species of animals. In poultry, Harvey wanted to find the Divine.

Best intentions, however, are rarely enough. What Harvey found in his eggs was enough to prove to his own satisfaction that Fabricius was wrong, but neither did they suggest that Aristotle was right.[49] He did not find the three principal parts – the liver, the heart and the brain – developing together, and nor were they the first signs of a new chick.[50] What Harvey found, besides the white and the yolk, was a speck of blood. That this would later develop into a pullet while isolated from outside influences by its shell – that an egg was both cause and effect of itself – originally seemed a paradox to Harvey. It suggested that the vegetative soul of the chick existed before the chick itself; that the embryo is nourished and grows before the digestive organs are formed; that the blood circulates before the heart is there to pump it or veins and arteries to contain it; that urine and bile were concocted alongside the urinary and gall bladders; even that

> not only is there a soul or vital principle present in the vegetative part, but even before this there is inherent mind, foresight, and understanding, which from the very commencement to the being and perfect formation of the chick, dispose and order and take up all things

[47] Harvey (1847b): 163-64.
[48] Ibid., 164-65.
[49] Indeed, far enough away from Aristotle that Harvey felt the need to justify his research by recourse to him. Ibid., 158-63.
[50] Ibid., 373-74.

> requisite, moulding them in the new being, with consummate art, into the form and likeness of its parents.[51]

Without the principal organs, there was no means to distinguish the three spirits; with the myriad changes the foetus underwent, there seemed to be no stable or inseparable connection between faculty and function.[52] Instead of providing additional support to Aristotle's *On Generation and Corruption*, Harvey's *Anatomical Exercises on Animal Generation* only seemed to disprove it.

Harvey's solution, bolstered by references to Aristotle and Leviticus,[53] was twofold. On the one hand, he dismissed all studies of the constituents of the blood as fruitless. Organs, comprised of a similar bodily material, could not be created from a heterogeneous substance, and so there could be no constituents of the blood. Indeed, Harvey continued,

> I can scarcely refrain from taunting and pushing to extremity the followers of Empedocles and Hippocrates, who believed all similar bodies to be engendered as mixtures by association of the four contrary elements, and to become corrupted by their disjunction; nor should I less spare Democritus and the Epicurean school that succeeded him, who compose all things of congregations of atoms of diverse figure.[54]

This was not only a slight against the Cartesian philosophy which would describe the universe in mechanical terms, but also the notion of temperament. On the other hand, he favoured an understanding of the blood that relied on its spiritual nature, finding in the blood stream the vital principle (*anima*) of the body, the fountain of life, the seat of the soul:

> To the blood, therefore, we may refer as the cause not only of life in general, - inasmuch as there is no other inherent or influxive heat that may be the immediate instrument of the living principle except the blood, - but also of longer or shorter life, of sleep and watching, of genius or aptitude, strength, &c.[55]

In generation, the blood was responsible for determining the sex of the child, the length of the pregnancy – from seven to fourteen months – which traits were inherited or skipped a generation, phantom pregnancies and abortions.[56] All deviation in the human body, whether in development or in normal health, was dependent upon the spirit travelling through the blood. Instead of a hierarchy of faculty and function, Harvey found more immediate and rawer acts of creation.

With such direct acts of creation, moreover, came for Harvey a more immediate recognition of the divine in the mundane.[57] Harvey found it in the blood as well: 'It is also celestial: for nature, the soul, that which answers to the essence of the stars, is the inmate of the spirit, in other words, it is something analogous to heaven, the instrument of heaven, vicarious of heaven.'[58] But more

[51] Ibid., 428-29.
[52] Ibid., 399.
[53] Ibid., 380.
[54] Ibid., 516.
[55] Ibid., 380.
[56] Ibid., 526.
[57] This was very different from Harvey's attitude in his *De Motu Cordis*, where the circulation of the blood held only allegorical significance. See Pagel (1951), Pagel (1957).
[58] Harvey (1847b, 507). See also Gregory (2014).

importantly, partaking more directly in the godly suggested that the blood also partook of His Providence, reflecting the divine mind in ways the rest of body did not. In short, that the blood obeyed the Word of God, the laws of nature, even when the rational part of ourselves was unaware of them:

> But nature, the principle of motion and rest in all things in which it inheres, and the vegetative soul, the prime efficient cause of all generation, move by no acquired faculty which might be designated by the title of skill or foresight, as in our undertakings; but operate in conformity with determinate laws like fate or special commandments – in the same way and manner as light things rise and heavy things fall.[59]

Spiders spin webs, birds make nests, bees make hives, and ants store food, all without 'forecast, instruction or reason.' Here, as in the case of the blood, the distinction between material, formal and efficient causes made no sense in view of the majesty of the first and final cause:

> all natural bodies are both the work and the instruments of that Supreme Good, some of them being mere natural bodies, such as heat, spirit, air, the temperature of the air, matter in putrefaction, &C., or they are at once natural and animated bodies; for he also makes use of the motions, or forces, or vital principles of animals in some certain way, to the perfection of the universe and the procreation of the several kinds of animated beings.[60]

For Harvey, in matters as simple as the winds, as complex as a pullet, or as perfect as a human, there was always the hand of the divine which humans, whatever their religion, had long recognised: called 'the Divine Mind by Aristotle; the Soul of the Universe by Plato; the Natura Naturans by others; Saturn and Jove by the ancient Greeks and Romans; by ourselves, and as is seeming in these days, the Creator and Father of all that is in heaven and earth.'[61] In other words, in order to reassert an Aristotelian *scientia* of the body, Harvey dismissed many of its most prominent features: the notion of temperament, the four causes, even the relations between macrocosm and microcosm. Moreover, with this view of life, the universe and the blood, there could be no real distinction between what is necessary and what is merely contingent, between physiological difference and disease, between faculty and function: what had been ordained by God could not be interrupted. What in our ignorance seemed to be the accidents of Nature was simply evidence of a higher order. Everything was part of His plan.

However, as with his work on the circulation of the blood, matters did not go according to Harvey's plan. His conclusions were not universally shared, even by those who conscripted Harvey and his reputation into their own arguments. In one respect at least, this is understandable: Harvey was renowned as an anatomist, not as a physician. Aside from one passage in his earlier work on the circulation of the blood, he did not explore the effect of his anatomical exercises on medicine.[62] Yet, while Harvey was busy trying to reconstruct the philosophy he had inadvertently brought into disrepute, other researchers – including those from Harvey's own University of Oxford – were investigating how Harvey's research affected understandings of medicine and the body, and in

[59] Harvey (1847b, 369).
[60] Ibid., 370.
[61] Ibid., 402.
[62] Harvey (1847a, 516).

particular, interpreting both in terms of the new chymistry. In the following section, we will examine just one of these researchers: Richard Lower.[63]

Lower

Indeed, even the circumstances in which Richard Lower came to write his 1665 *Diatribae Thomae Willisii … de febribus vindicatio* demonstrate his attempt to distinguish chymistry from Galenism. It was a response to an attack from the Bristol-based Irish physician Edward O'Meara on his mentor, the Oxford Sedleian Professor of Natural Philosophy, Thomas Willis. In his *Examen diatribae Thomae Willisii*, O'Meara laid out a sarcastic, Galenic attack on Willis' work, and this inspired Lower to write an even more heated reply.[64] But in the process of criticising O'Meara and praising Willis, in pressing Harvey into the service of chymistry, Lower also redrew the boundaries between certain and uncertain medical knowledge; of what the physician was capable and incapable of in medical practice. In short, Lower helped to shift the place of contingency in seventeenth-century medicine.

To begin with, Lower praised William Harvey as an anatomist, and especially the interpretation that Harvey gave of the blood in his *Exercitationes de generatione animalium*. But, for Lower, Harvey had not gone far enough: his bonfire of the faculties – an act which O'Meara as an orthodox Galenist repudiated – had left behind some fragments of his Aristotelianism, which Lower was determined to expunge. Criticising O'Meara's Hippocratic account of purgative medicines, Lower wrote that:

> an experimental and (whatever you murmur to the contrary) sounder philosophy hardly admits a similar, let alone an elective attraction, in natural objects; but more correctly attributes all their local motions to impulsion, inasmuch as some particles are impacted on others, and thus drive or propel them hither and thither.[65]

This better explained the actions of medicine, Lower believed, as well as the actions of magnets and electricity. For Lower, there was no necessary connection between matter and function, no notion of teleology in the material world. Indeed, for Lower the entire body was little more than a mechanical device. How the blood circulated was not based upon relations between microcosm and macrocosm but upon a resemblance between the body and a chymist's alembic:

> It is perfectly plain that, having been impregnated with certain particles analogous to wine and others to milk, [the blood] is kindled in the heart, leaps out of it into the arteries, and passes through them in flames, as through the channels of a reverberatory furnace; it thus spreads the vital warmth throughout the whole body, and at the same time dispenses the matter needed both to nourish the solid parts and to generate the animals spirits.[66]

Blood was not prepared in the liver and heart as if made, Lower sneered at O'Meara's suggestion, in a kitchen full of chefs 'perhaps the same way as preparing a ragoût.'[67] But neither did the blood act as if the direct agent of the soul. For Lower, the blood was a spiritual entity, not in Harvey's sense of heaven and earth, but as wine in a vat, creating itself through its own fermentations.

[63] On research conducted in Oxford in the wake of Harvey's discoveries, see Frank (1980).
[64] A full account of this exchange can be found in Lower (1983, xiii-xxxiv).
[65] Ibid., 240.
[66] Ibid., 245.
[67] Ibid., 216.

In other words, Willis had created and Lower expounded an understanding of the body resting upon the importance of the blood, which in turn depended upon its constituents: in short, a notion of temperament. However, this was also a radically different understanding of temperament from its Galenic predecessor. Not only were the four primary qualities translated into five chymical principles, but Lower denied any direct connection between these principles and the humours of the body:

> It appears that the whole blood-mass is as it were the general treasury into which all kinds of taxes, revenues, and imposts are gathered and also on which all kinds of payments and expenses for the benefit of the entire living body are drawn; venous blood corresponds to the duties of the public collector, arterial blood to the paymaster.[68]

Indeed, Lower questioned whether the four humours had ever been seen in medical practice. More likely, he considered, were the various substances prickling, squeezing and scraping against the intestines and bile ducts an almost infinite range of chymical mixtures colouring the excrements collected by the physician, their only distinguishing traits being their severity: gentle, moderate, or strong.[69] With countless chemicals racing through the blood stream, each liable to combine with every other, there was no basis on which these could be the foundations of temperament. What was carried in the blood could make you ill; it could not make you who you are.

But even considering disease highlighted both the fragility of the body and the countless ways in which it could become ill. Once again like an alembic, for Lower the body required heat in order to function properly. But similarly, the right conditions were needed to keep this vital flame alight: a suitable quantity of inflammable matter (the blood), a suitable wick (the heart), and ventilation for the resulting soot (the lungs).[70] When, for whatever reason, the flame of life burnt too bright, such as in fevers but also in jaundice, scurvy and emaciating diseases, then

> the effluvia of heat from the burning blood, pouring in all directions, pervade the pores and passages of all the parts, just as in the still the atoms of heat given off by the fire pass through iron and stone, the sides of glass, and the liquid contained in it with no trouble.[71]

Conversely, long illnesses, haemorrhages and sudden joy summoned the blood away from the heart towards the extremities.[72] When the flame was snuffed out, death ensued. But more importantly, missing from this understanding of disease was the pretence that Willis, or any physician, could catalogue all the body's infirmities. For Lower, O'Meara had missed this important point, 'cavilling at it for not being a "complete definition consisting of genus and differentia, where the subject and the efficient cause should have been given in the place of the genus, and the formal cause in that of the differentia."'[73] Willis had only intended to describe fever, and indeed he thought that this was all a good physician could achieve.[74] For Lower, there were no essences and accidentals of disease: these gave the false reassurance that medical knowledge was complete. There was no definitive moment

[68] Ibid., 245.
[69] Ibid., 240.
[70] Ibid., 258.
[71] Ibid., 275.
[72] Ibid., 258.
[73] Ibid., 200-01.
[74] Ibid., 207.

of crisis, no help from the ancient authorities who wrote far away from England and even further away in history.[75] There were only chemicals, and the physician's vigilance to prescribe them well.

In short, what Lower provided in his interpretation of Willis' account of fever was an account of the body, disease and the universe the complete opposite to that provided by Harvey, and this in the name of advancing Harvey's research project. Where Harvey had emphasised the spiritual aspect of the body over its material constituents, Lower stressed the latter. Both rejected the notion of temperament; both considered disease to be inscrutable, but for different reasons. Lower was much more sensitive to the ambiguities embedded within medical knowledge: there could be no *scientia* when so little was known of how chemicals affected the body, and no certainties when medical knowledge was put into practice. In other words, contingency cast a greater shadow over chymistry than it did over Harvey's anatomy or Galenic medicine. Yet, neither could Lower suggest any means of mitigating such contingencies in medicine other than greater attention to the effect that remedies had on each individual patient. Chymistry offered no method through which medicine could be remade as a science. That goal was attempted by our next thinker: John Locke.

Locke

Although better known today as a political philosopher, Locke's interest in medicine was more than that of an interested observer. He received medical education from both Oxford and Leiden, provided medical care to his patron Lord Anthony Ashley Cooper, Earl of Shaftesbury, and took an interest in Helmontian chymisty early in his career.[76] However, when Locke came to write about medicine – specifically his *Anatomia* (1668) and *De Arte Medica* (1669) – he criticised not only the state of contemporary medicine but also the advances in physiological research that had resulted from Harvey's discoveries. For Locke, both drew upon the questionable authority of a single field: anatomy.

It was not that Locke considered all anatomical knowledge redundant: it was an absolute necessity for surgeons and a useful aid for physicians when prognosticating wounds, humours and other organic diseases; it directed therapeutics and recovery; and it was 'a great help to [the physician's] memory and guide to his practise.'[77] What Locke questioned was the conclusions that had been drawn from anatomical experiments. All that anatomy could reveal was 'the gross and sensible parts of the body, or the vapid and dead juices.'[78] What it could not show, Locke continued, was how the body functioned: how those bodily juices operated within 'the regimen of the life and spirits of the body;' how parts of the body altered, and were altered by, those humours.[79] New microscopes had revealed both tiny animalcules and the poverty of human vision.[80] Life could not be inferred from death: autopsies merely revealed 'new superficies for ourselves to stare at.'[81] Textures of organs or types of ferments within the body, Locke regarded, nobody could hope to find or pretend to detect.

[75] Ibid., 283.
[76] See Anstey & Principe (2011), Anstey (2010). The philosopher Patrick Romanell believes that the foundations of Locke's *Essay Concerning Human Understanding* (1690) lie in his medical training. Romanell (1984).
[77] [Locke] (1966, 85).
[78] Ibid., 85.
[79] Ibid., 89.
[80] Ibid., 92.
[81] Ibid., 88.

But Locke's criticisms went further. As he explained a year later in *De Arte Medica*, medicine at its best included knowledge of causes, but this was a temptation which physicians should resist. He was wary of those who looked for 'the hidden causes of distempers' or tried to imagine 'the secret workmanship of nature and the severall unperceptible tools wherewith she wrought.'[82] To expect Nature or God to follow the precepts of man, to think that countless works on generation and corruption, nutrition and assimilation could benefit mankind, Locke continued, was like seeing faces in the clouds: at best a fantasy, at worst a wilful blindness to what could aid both science and medicine. There was little doubt that the pox was a sexually transmitted disease, an anatomist was not needed to work that one out, 'but can he hence discover to me what kinde of venom it is that produces such horrid effects in the body? Why it corrodes this or pains that part of the body?'[83] Even the attention which physicians had given to the blood and its constituents – the foundations of temperament – came under Locke's critical disdain. The blood was essential for health, Locke wrote, but after tasting or smelling it, after noting its colour and consistence, we are still left with little clue about the characteristics make blood healthy or diseased: it could not help the physician distinguish between intermittent or continual fever, between dysentery or haemoptysis, between a healthy and a dangerous haemorrhage.[84] In short, even the symptoms of disease were no guide to diagnosis, prognosis or recovery.

However, Locke did not regard all theoretical endeavours as inherently misguided and useless. After all, physicians knew that 'rhubarb or pellitory have in them fit wedges to divide the blood into such parts as may be separable, urin [sic] in the one, gall in the other, or any other particles in them fitted to open these passages.' Apothecaries knew how to mix their elixirs, minerals and botanicals, regulate their potency and prepare them for the individual patient. What made these practices exemplary for Locke was that this knowledge did not reach into some underlying, unknowable reality:

> All this is only from history and the advantage of a diligent observation of these diseases, of their beginning, progress, and ways of cure, which a physician may as well doe without a scrupulous enquiry into the antomye of the parts, as a gardener may by his art and observation, be able to ripen, meliorate and preserve his fruit without examining what kinds of juices, fibres, pores, etc. are to be found in the roots, barke, or body of the tree.[85]

For Locke, the temptation to make unwarranted speculations about disease would only be overcome when physicians embraced the inner discipline of a gardener: pruning here, training there, never making any drastic interventions, and all the while recording observations. In short, Locke believed that medicine could only become scientific when it was founded upon *historia*: case studies of the appearances of the universe – both natural and human – without discussion of cause or essence. This practice was much maligned by Aristotelian and Scholastic philosophy, but in medicine, modelled on Galen's *curationes*, it had gained popularity since the fourteenth and fifteenth centuries.[86]

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[82] Ibid., 80-81.
[83] Ibid., 85.
[84] Ibid., 90-91.
[85] Ibid., 86.
[86] See Pomata (2005).

Yet the *historia* which Locke advocated was not that of Galen and the College of Physicians, but the *historia* of the Royal Society. With Francis Bacon, Locke believed that experience was the foundation of knowledge but not a guarantee of it; from Robert Boyle, Locke held that the universe was mechanical, and that true knowledge, the knowledge that no sane person could question, came from good measurement.[87] For Locke, classifying diseases, plants and chemicals, and then recording their effects on the body, were all important steps towards sound medical knowledge, but since they relied upon human observers they were still open to prejudice. But how Locke intended medicine to be established on sound methodological principles – how physicians were to observe the unknown without descending to speculation – only became clear in 1704 in a report to the Royal Society. Here, Locke chronicled the air pressure, air moisture, and the direction of the wind in Oates, his residence in Essex. In short, Locke believed that with constant and accurate records of the weather, then 'many things relating to the Air, Winds, Health, fruitfulness, &c.,' would be known, 'to the great advantage of Mankind.'[88] Of course, such a sentiment was not new: attention to climate and the weather had been staples of medicine since the Hippocratic *Airs, Waters and Places*. More significant was the importance that Locke now placed upon the airs: constituted by countless, invisible particles and governed by forces we cannot imagine, but it could be measured with impartiality, without undue generalisation or causal speculations. From such small beginnings, Locke proposed, all ailments would, eventually, be conquered. Temperament, disease and semiotics, the conventional Galenic means of mitigating the effects of contingency, were here replaced with a single, overarching entity: the constitution of the self replaced with the temperament of the air.

Epilogue – Friedrich Hoffmann

The changes outlined in this chapter – whether to concepts of the universe and its constituents, the nature of the body and disease, or the appropriate means by which to study them – all had the potential to drastically alter medicine. After all, Galenism combined Hippocratic aphorisms with Aristotelian philosophy: the primary qualities of the universe could be read from the skin. However, the influence that each of these thinkers had upon seventeenth-century medicine is much more difficult to establish. Each wanted to uphold, reform, or reject the standards and dignity of medicine, but even the reformers stood for sometimes mutually contradictory positions. It would be a mistake, therefore, to think that late seventeenth-century physicians uncritically absorbed these new developments, just as it would be an error to think that medicine was simply unaffected by them. This epilogue examines the work of the Magdeburg physician Friedrich Hoffmann, who trained at Jena and Erfurt, gaining his medical degree in 1681, later travelled to Holland and England, where he met Robert Boyle, and, two years prior to the publication of his *Fundamenta Medicinae* in 1695, was appointed to the chair of Medicine and Natural Philosophy at the University of Halle. In other words, Hoffmann was aware of the works of Harvey, Lower and Locke, and what implications these had for medicine. His work was an attempt at reconciling these conflicting interests in a textbook for his students, and alongside Hermann Boerhaave, he set the tone for medical discourse into the eighteenth century.

Most strikingly, Hoffmann did not regard medicine as a *scientia*, as Rivière had considered, nor as a mechanical art. Instead, Hoffman believed that it had elements of both, that 'As far as medicine uses

[87] Peter Anstey (2011, 51-66). For a more critical view, see Milton (2001).
[88] Locke (1704, 1919).

the principles of physics, it can be properly called a science; as far as it relies on practice, it can be called an art.'[89] But while Hoffmann thought that medicine could gain the best from both worlds – the science of the Moderns and the wisdom of the Ancients[90] – this did not mean that the budding physician could simply pick what was most convenient from either. To begin with, Hoffmann shared with Boyle the notion that the universe must be understood according to mechanical principles: 'The first principles of mechanics are matter and motion; therefore, the elements thought up by the peripatetics and the chemists are mere imaginings.'[91] Size and shape, motion and rest were the only qualities in Hoffmann's universe: there were no substantial forms, only accidents of matter. Health, Hoffman continued, was:

> When the different small particles constituting the blood – earthy, branching, watery, saline, volatile, fixed, acid, or sulphurous – are intermixed in a proportionate fashion, so that they bring about an even motion among themselves, then the blood is considered properly mixed [*temperatus*] and a smooth proportion [*blanda temperies*] is introduced into the solid parts.[92]

What proper proportion was, or how it was to be measured, Hoffmann did not say. But temperament itself could be easily explained, and Hoffmann paid little attention to the provenance of the terms he used. When sulphurous, oily, volatile or saline particles dominated over fixed, watery or earthy particle, a sanguine or, in the worst cases, a choleric disposition resulted, producing a bold, cheerful, ingenious, and quick individual. If the opposite was the case, then a phlegmatic or melancholic, rather slow, timid, and sad person would be the result. A range of circumstances could influence the natural temperament for each individual: parentage, origin, soil, the heavens, age, disease, mode of life, sex. In other words, while Hoffman believed in a mechanistic universe, that matter in motion best reflected the underlying processes of the body, such terms meant very little for the budding physician. The distinction that Hoffmann created was not between science and art but between theory and practice.

Indeed, when Hoffmann considered disease, the eclectic range of theories that he drew upon is even clearer. He defined disease as 'When the vital actions, involved in the movement, sensation, and nutrition of the machine, are injured, then disease is said to be present, or an abnormal disposition of our machine,' but these were caused by imbalances within the blood: disordered motions, unregulated fermentations, overly wet or dry humours.[93] Epidemic diseases, such as fever, could be caused by malignant poisons and miasmas in the air, but were also influenced by the position of sun and moon, the direction of the winds, the climate and effluvia from the earth, and obstructed pores in the skin.[94] But more importantly, the task of the budding physician was not simply to read the signs of the body to divine the course of the disease but to affect a cure. Of course, for Hoffmann such remedies could derive from any source – 'It is always completely necessary to use both chemical and galenical medicines'[95] – and have to take into consideration the motions of the animal

[89] Hoffmann (1971, 6).
[90] Ibid., 3.
[91] Ibid., 6.
[92] Ibid., 11-12.
[93] Ibid., 39-40.
[94] Ibid., 51.
[95] Ibid., 116.

spirits and the blood; the causes and circumstances of the disease; and the nature, mode of action and contraindications of the medicines to be used.[96] However as Hoffmann noted, there was no guarantee that any such treatments would work: 'Remedies exert their effect in our bodies not by their own activity but by the way they are received. Hence the physician cannot always be sure of the effects of the drugs.'[97] For Hoffmann, this was the predicament of contemporary medicine, that 'the safest way to choose effective drugs is *a posteriori*.'[98] In short, within Hoffmann's view of medicine the distinction between theory and practice generated many benefits, but between them they created a paradox. Medical practice was freed from the cavilling of rival sciences, indeed somehow still a beneficiary of the great variety of therapies that they were increasingly amassing. But the sciences could not guide how these remedies should be used. Instead of universal laws, Hoffmann dealt with generalities: there was no way to reach the individual patient.

Hoffmann's answer to this dilemma, what determined the method of cure and whether the treatment was successful, was the physician's sense of judgement:

> "Good luck" in medicine is clear-sighted knowledge of the causes of disease and of remedies, and judgement in applying them. And in this way the physician skilled in his profession can create good luck for himself.[99]

But judgement, Hoffmann continued, only came from two sources, without either of which all cures would fail. First, there was experience. The budding physician should be an eclectic reader, but without the gradual accumulation of individual cases there could be no way in which the particular could somehow be transformed into the general, and from which he could make correct and wise prognoses, and win his reputation. Indeed, for Hoffmann, 'Without experience a physician would be as ashamed as would Jesus without the Law.'[100] But before even this education could begin came the second and more urgent source of medical judgement. The budding physician needed to possess Reason, or at least, a particular type of Reason: 'Reflection [*ratio*] and deliberation, the arts appropriate for the commander and the leader, are equally so for the physician.'[101] It was this that transformed medicine into a calling rather than a profession; that warranted the respect that physicians deserved. But it was also the one aspect of medicine that could never be explained by any textbook or taught by any medical professor. When previous experience fails and theory flees, the budding physician had to rely on his own strength of character to head into the unknown.

Looking back over the period from the 1620s to the 1690s – medicine during the scientific revolution – the works detailed in this chapter seem only to reinforce the historian's maxim that each age contains both great change and great continuity. Great change, from Harvey's exercises on the circulation to concepts of the body as furnace and machine, from *scientia* to science, new understandings of God and His providence, new ways to measure Nature and a new awareness of its rich pharmacopeia. Within medical knowledge, subtle changes in word usage and meaning belie dramatic conceptual shifts in how physicians perceived themselves and their discipline: from universals and particulars to individuals and generalities, from *scientia* to science, from *techne* to art,

[96] Ibid., 117.
[97] Ibid., 118.
[98] Ibid., 119.
[99] Ibid., 118.
[100] Ibid., 115.
[101] Ibid., 115.

from semiotics to therapeutics, from the physician as judge to the physician as commander. However, the events outlined above also seem to lend the old adage a new piquancy: Rivière may represent the Ancients, an older medicine that was succeeded by the Moderns - represented by Hoffmann - but both medical textbooks were in circulation together, competitors in the market for medical students. It is this which has puzzled historians such as Lester King and Roger French: at exactly the moment when medicine would cast off the shackles of Galenism, to embrace demonstrable truth and the means to discover more, late seventeenth-century physicians still held on to the old theories, seemingly indifferent to the quality and source of their medical knowledge.

An explanation for this reticence is outside the purview of this chapter. Indeed, as such a task ultimately depends on examining the personal preferences of physicians practicing throughout Europe from the late seventeenth century to perhaps the early nineteenth century, a full account seems unlikely. But one influence which may help our understanding is to consider the changing attitudes towards contingency. For Rivière, doubt and uncertainty were acknowledged facets of medicine: notions of temperament and disease and, indeed, reading the signs of both on the body, were means of finding the patient's place in the universe. Where there were uncertainties, there were ways by which they could be made to seem more certain. Yet, these connections were ultimately what were attacked during the late seventeenth century: by Harvey's anatomy, with its dismissal of temperament; Lower's chymistry, with its plethora of diseases; Locke's *historia*, with its mistrust of semiotics. This is not to say that these concepts died away – even temperament is a concept familiar to us today – but that they no longer tied medicine to a greater scheme of nature. What Harvey, Lower and Locke had left behind were new intellectual fields, created by rearranging and splitting this broader view of medicine apart: a physiology separate from physics, medical theory distinct from medical practice, medical texts supplementary to the physician's skill. Rivière's *The Universal Body of Physick* could be placed alongside Hoffmann's *Fundamenta Medicinae* because all the attempts to establish clear and certain medical principles, to make medicine scientific, could not reduce the uncertainties and unknowns within it. Rather, contingency merely passed out of view – from the body into nature, and then into the physician's judgement – to become an even more powerful, and yet unspoken, part of medicine.

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