UNDERSTANDING AFFINITY
Locke on Generation and the Task of Classification

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Locke's theory of classification is a subject that has long received scholarly attention. Relatively little notice has been taken, however, of the special problems that were posed for taxonomy by its inability to account for organic processes in general. Classification, designed originally as an exercise in logic, becomes immediately complicated once it turns to organic life and the aims of taxonomy become thereby caught up with the special problems of generation, variation, and inheritance. Locke's own experience with organic processes—experience garnered through his early work in both botany and medicine—suggested to him both the dynamism of nature and the necessary artificiality of an *a priori* system of classification. These early reflections thus reinforced his critique of classification in the *Essay Concerning Human Understanding*, and by tracing their influence it is possible to approach Locke's nominalism from a fresh perspective.

I. Locke's approach to questions concerning the generation and classification of nature is best introduced by way of a brief reminder regarding Aristotle's and Boyle's roles in providing the backdrop for Locke's discussion. It is well understood that Aristotle's empirical investigations into organic processes were founded on his metaphysical account of the soul. Whether it was referred to as an animating principle or an entelechy, the soul explained the experience of a formative force in all living things; it made sense of life as an inner motion and of reproduction and growth as

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movement toward a specified goal.[1] In the seventeenth century, however, Aristotle's account was under attack from a number of fronts so far as the souls of plants and animals were concerned. The foremost of these attacks stemmed from religious precepts, ones flowing almost directly from Calvin's insistence that God's agency be accepted as the only source of activity in the natural world.[2] This position supported the kind of mechanical philosophy being promoted by Galileo and Descartes as well, since in their view nature was a realm filled with animate machines. From this philosophical perspective everything in nature was reducible to mechanical principles including, and especially, the organic body itself: the workings of muscle and tendon could be depicted as systems of pulleys, the heart likened to water bellows, and the

[1] See, for example, 'De Anima', 415b, 9–30, in *The Complete Works of Aristotle*, ed. Jonathan Barnes (Princeton: PUP, 1984). For some discussion of the role played by metaphysics for Aristotle's theory of sexual reproduction see J. M. Cooper, 'Metaphysics in Aristotle's Embryology', *Proceedings of the Cambridge Philological Society*, 214 (1988), 14–41; A. Code, 'Soul as Efficient Cause in Aristotle's Embryology', *Philosophical Topics*, 15 (1986), 51–60; and D. Henry, 'Understanding Aristotle's Reproductive Hylomorphism', *Apeiron: A Journal of Ancient Philosophy and Science*, 39 (2006), 269–300. While the situation is more complicated when explaining the spontaneous generation of lower animals, the metaphysical models are still presupposed, and in fact synonymy is preserved. A helpful discussion of this is in D. Henry, 'Themistius and Spontaneous Generation in Aristotle's Metaphysics', *Oxford Studies in Ancient Philosophy*, 24 (2003), 183–208.

[2] In a typical formulation Calvin declares that 'concerning inanimate objects, we ought to hold that, although each one has by nature been endowed with its own property, yet it does not exercise its own power except in so far as it is directed by God's ever-present hand. These are, thus, nothing but instruments to which God continually imparts as much effectiveness as he wills, and according to his own purpose bends and turns them to either one action or another'. J. Calvin, *Institutes of the Christian Religion*, ed. J. McNeil, 2 vols. (Philadelphia: Westminster, 1960), book 1, chapter 16, section 2. A well-researched discussion of the impact of Reformation theology on 17th-century mechanical philosophy is Gary B. Deason's 'Reformation Theology and the Mechanistic Conception of Nature', in *God and Nature*, ed. David C. Lindberg and Ronald L. Numbers (Berkeley: University of California Press, 1986), 167–91. A clear account of Boyle's work to make sense of matter in motion within the constraints set by reformers is in Peter Anstey's *The Philosophy of Robert Boyle* (New York: Routledge, 2000), esp. 164ff.

nerves could be imagined to work like so many vibrating strings leading up to the head.[3] Calvin's Reformationist tenets thus easily combined with mechanical philosophy to describe nature as a collection of complex machines whose internal mechanisms were reliant upon God. But the central problem with this portrait of nature, a problem increasingly felt over the course of the seventeenth century, was that even the most elaborately imagined mechanisms could not account for the most constant experiences of organic life. They failed to explain the processes by which organisms were able to maintain and reproduce themselves, and they made no sense at all of the processes of inheritance, despite the fact that breeders and horticulturalists were everywhere engaged in the attempted manipulation of them. And these sorts of everyday tensions between theory and practice were only compounded by the epistemic problems seen to be facing classification.

Because classification requires criteria for sorting, the determination of what can serve as criteria for this sorting is the first task in setting up a taxonomical system. For most of the history of classification leading up to Locke, the goal of taxonomy had been to create what systematists described as a 'natural system', that is, a system that was capable of mirroring the divisions that were thought to exist within nature itself. The theoretical basis for this belief in natural divisions had been provided by Aristotle. In Aristotle's account, the formative force of the soul was responsible for directing organic processes toward a specified end, for moving an organism from a merely potential existence to a complete form. But in its formative capacity the soul not only explained, for example, why acorns become oaks, it was thought to serve also as the discriminating judge when it came to determining the essential

[3] The classic example of this is Borelli's *De motu animalium* (1680–81), but Descartes's *Treatise on Man* serves just as well. A survey of contributors to the rise in mechanist anatomy is in R.S. Westfall's 'Biology and the Mechanical Philosophy', *The Construction of Modern Science: Mechanisms and Mechanics* (Cambridge: CUP, 1977), 82–104.

features required for an oak to be an oak. It was as a result of this kind of work that nature could be understood to have divided itself up according to essential features, to have produced, in other words, a set of essential divisions underlying the possibility of a natural system.[4] But while Aristotle took such essential divisions to be real in nature, he was himself unconfident that the classificatory process of logical subordination could be adequately applied to biological life for as he saw it, it could never be clear to the taxonomist what nature itself had taken to be the essential or subordinate features of a given organism.[5] As Aristotle conceived of the problems facing taxonomy, the difficulties lay primarily on the side of the tax-

[4] This formative work on the part of the soul is distinct from the role played by matter with respect to individuation. On the difference see G.E.R. Lloyd, 'Aristotle's Principle of Individuation', *Mind*, 79 (1970), 510–29.

[5] 'Parts of Animals', 643b27f., in *The Complete Works of Aristotle*, op. cit. See also G. E. R. Lloyd's 'The Development of Aristotle's Theory of the Classification of Animals', *Phronesis*, 6 (1961), 59–81. Aristotle's caution was overlooked in the fact of the overwhelming practical needs facing taxonomists in the 16th century. The most important figure in this history was Andreas Cesalpino. Cesalpino was determined to develop botany as a proper science, but to do so he had to retrieve it from the province of medical gardeners and their chaotic classification schemes within the many *materia medica* being produced at the time. In contrast to these sorts of practical aims regarding the development of medicinal recipes, Cesalpino's interests were primarily theoretical and he saw the development of a universal classification system to be the necessary basis for any true botanical science. Taking his lead from Aristotle, Cesalpino argued that reproduction was the essential function of a plant and that a natural system of division could therefore be established according to the parts of fructification as the most essential features of a plant. As he put it, 'From the means of producing fruits many genera of plants can be distinguished. Indeed, in no other structures has nature formed such a multiplicity and distinction of organs as are seen in the fruits ... Therefore we shall try to investigate the genera of plants by means of the unique fructifying characters which have been provided us by the Grace of God, both in the trees and shrubs, and in other plants'. In Andrea Cesalpino, *De plantis libri XVI* (Florence, 1583), Bk. I, p. 28. Phillip R. Sloan emphasizes Cesalpino's incorporation of Aristotle in 'John Locke, John Ray, and the Problem of the Natural System', *Journal of the History of Biology*, 5 (1972), 1–53, esp. at 9–13. For further discussion of Cesalpino see Julius von Sachs's discussion in his *History of Botany (1530–1860)*, translated by Henry Garnsey (Oxford: Clarendon Press, 1906), 37–66, and A. G. Morton's *History of Botanical Science* (London: Academic Press, 1981), 128–48.

onomists and their ignorance with respect to nature's essential divisions. This problem went a step further for seventeenth-century mechanists, however, in so far as corpuscular ontology had rejected not only the soul as a basis for discerning essential differences between living organisms, but the very notion of essential divisions existing within matter at all.

Corpuscular ontology had received its most concerted defence in the work of Robert Boyle, a thinker who was as much concerned with an extirpation of the chemical principles of Renaissance Naturalism as he was with advancing his new corpuscular philosophy. He embraced corpuscular ontology in part, therefore, because it eliminated the possibility of irreducible elements—the mercury, salt, and sulphur of the Paracelsians—by taking matter to be substantially identical in all its parts.[6] Differentiation within matter, according to Boyle, occurred only as a result of shifts in the relative size, texture, and motion of the corpuscles. This meant that all material objects were the result of nonessential patterns of aggregation, patterns that had been produced by what Boyle described as a material 'convention' or 'stamp' upon an indifferent collection of matter.[7] But while this kind of corpuscular ontology

[6] 'The Origin of Forms and Qualities According to the Corpuscular Philosophy', in *Selected Philosophical Papers of Robert Boyle*, ed. M. A. Stewart (Indianapolis: Hackett Publishing Co., 1991), 49f. For a lengthier discussion see Boyle's 1675 essay, 'Of the Imperfection of the Chemists' Doctrine of Qualities', ibid. 120–37.

[7] On this point Boyle's target was the Aristotelians' reliance on a substantial form to provide unity to matter and, in particular, Daniel Sennert's hybrid of corpuscular-Aristotelianism. See William Newman, *Atoms and Alchemy* (Chicago: University of Chicago Press, 2006). Boyle's language of matter's convention is meant, therefore, to replace the metaphysical concepts of both substance and form, arguing, moreover, that discussions of generation, corruption, and alteration can be adequately redescribed in terms of matter's convention, dissolution, and transposition due to local motion. See Boyle's 'The Origin of Forms and Qualities According to the Corpuscular Philosophy', in *Selected Philosophical Papers of Robert Boyle*, op.cit. 44. The convention or 'stamp' of corpuscles can thus explain the relatively stable properties demonstrated by metals, for example, without compromising the basic ontology regarding matter's essential plasticity: 'For such a convention of accidents is sufficient to perform the offices that are necessarily required

allowed Boyle to respond to the iatrochemists, it also meant that he would be incapable of providing essential criteria by which inorganic matter could be meaningfully identified and sorted.[8]

When it came to accounting for organic matter, Boyle had appealed to a physicalist view of seminal principles. For Boyle, the sheer complexity of organic life exceeded the chance that its original formation had been due to the principles of secondary motion alone. Against the theory proposed by Descartes and his followers, therefore, Boyle argued for an original act of divine artifice that 'did more particularly contrive some portions of that matter into seminal rudiments or principles, lodged in convenient receptacles (and, as it were, wombs), and others into the bodies of plants and animals'. These seminal principles took on a formative function in directing the material unity of the organism, for 'some

in what men call a *form* since it makes the body such as it is, making it appertain to this or that determinate species of bodies, and discriminating it from all other species of bodies whatsoever', ibid. 40. On this see also Dennis Des Chene, 'From Natural Philosophy to Natural Science' in *The Cambridge Companion to Early Modern Philosophy*, ed. Donald Rutherford (Cambridge: CUP, 2006), 67–94, 79.

[8] Thus despite the fact that Boyle was the first person to develop chemical identification tests, for example, the ontological theory guiding Boyle's investigations meant that he was unable to discern their true significance for the development of a system of classification. See Richard S. Westfall's discussion in *The Construction of Modern Science*, op. cit. 79: 'Again [Boyle's] mechanical philosophy appears to have operated to thwart the most promising aspect of his chemistry'. It should be noted that recent work on Boyle's chemistry has suggested, against a long-standing tradition in line with Westfall's reading, that interpretation of Boyle's corpuscular ontology cannot simply understand it according to its mechanical principles but should in fact include the integration of *semina rerum*—particles endowed with different degrees of formative force and therefore not substantially identical—into corpuscular philosophy by the mid 1750s. See especially Antonio Clericuzio's discussion of Boyle in his *Elements, Principles, and Corpuscles: A Study of Atomism and Chemistry in the Seventeenth Century* (Dordrecht: Kluwer, 2000). A reconsideration of 'inert matter' can also be found in Simon Schaffer, 'Godly Men and the Mechanical Philosophers: Souls and Spirits in Restoration Natural Philosophy', *Science in Context*, 1 (1987), 55–85, and John Henry, 'Occult Qualities and the Experimental Philosophy: Active Principles in Pre-Newtonian Matter Theory', *History of Science*, 24 (1986), 335–81.

juicy and spirituous parts of these living creatures must be fit to be turned into prolific seeds, whereby they might have a power, by generating their like, to propagate their species'.[9] Although Boyle did not describe the exact means by which the formative work of the seminal principles were operating, he clearly considered the process to be physical as opposed to soul-driven.

> I very well forsee it may be objected, that the Chick with all its parts is not a Mechanically contriv'd Engine, but fashion'd out of Matter by the Soul of the Bird ... which by its Plastick power fashions the obsequious Matter, and becomes the Architect of its own Mansion. But not here to examine, whether any Animal, except Man, be other then a Curious Engine, I answer, that this Objection invalidates not what I intend to prove from the alledg'd Example. For let the Plastick Principle be what it will, yet still, being a Physical Agent, it must act after a Physical manner, and having no other Matter to work upon but the White of the Egg, it can work up that Matter but as Physical Agents, and consequently can but divide the Matter into minute parts of several Sizes and Shapes, and by Local Motion variously context them.[10]

Boyle's commitment to a material interpretation of the work done by the seminal or plastic principle was clear from his appeals 'Physical Agents'.[11] Finishing the point, he explained 'that the

[9] 'The Origin of Forms and Qualities According to the Corpuscular Philosophy', in *Selected Philosophical Papers of Robert Boyle*, 70.

[10] 'Considerations and Experiments, Touching the Origin of Qualities and Forms. The Historical Part', in *The Works of Robert Boyle*, 14 vols. ed. Michael Hunter and Edward B. Davis (London: Pickering & Chatto, 1999), v. 383–4.

[11] Boyle's recourse to a physical yet 'plastick' principle when explaining generation demonstrates the genuine difficulties faced by mid-century theorists in accounting for biological processes. As Peter Anstey describes Boyle's position, 'study of Boyle's theory of seminal principles reveals a Boyle who is in tension, not a Boyle who abandons the corpuscular hypothesis when intruding on the biological domain and not a Boyle who is unaware of the need to reach beyond the sparse ontology of mechanical affections of matter. Boyle was unable to resolve this dilemma in his natural philosophy and as interpreters we should not do it for him'. 'Boyle on Seminal Principles', *Studies in History of Biological and Biomedical Sciences*, 33 (2002), 597–630, at 628.

Formative Power (whatever that be) doth any more then guide these Motions, and thereby associate the fitted Particles of Matter after the manner requisite to constitute a Chick, is that which I think will not easily be evinc'd'.[12]

Boyle's efforts to blend a corpuscular ontology with an account of seminal principles left open questions, however, regarding the coherence of mechanical approaches to nature. This incoherence was clearest with respect to taxonomical issues, since the ontology underlying the corpuscular theory of matter appeared to make classification impossible at the same time that the uneasy addition of materially conceived seminal principles were supposed to allow for it in the case of organic life. It was these strands in Boyle's thought that were most carefully taken up for consideration by John Locke. And it was here that Locke's own experience in medicine and botany would lead him to recognize the need to separate the problem of classification from the account of ontology. Taxonomy was a process of naming, according to Locke, and as such it was an endeavour that said more about decisions made by the taxonomist than it did about nature. And nothing could demonstrate the arbitrary nature of classification as much as could the fluid processes of organic generation and growth.

[12] 'Considerations and Experiments, Touching the Origin of Qualities and Forms. The Historical Part', op.cit. 384. Boyle's description of formative power in terms of a motion for fitting together particles is perhaps not so far from Descartes's discussion of bodily processes in his *Treatise on Man*; generation, for Descartes, is due to motion yielded by the heat of fermentation (like 'yeast'), this fermented mixing of the seminal fluids from the two sexes moves the individual particles into the form required to become parts of the body (*Description of the Human Body*, AT 253). Further discussion is in Vincent Aucante, 'Descartes's Experimental Method and the Generation of Animals' in *The Problem of Animal Generation in Early Modern Philosophy*, ed. Justin E. H. Smith (Cambridge: CUP, 2006), 65–79. The critical role played by motion and heat for Descartes and Boyle reveals the 17th century's pervasive indebtedness to Aristotelian models. See references note 1 and the helpful discussion of Aristotle's theories and influence in Remke Kruk, 'A Frothy Bubble: Spontaneous Generation in the Medieval Islamic Tradition', *Journal of Semitic Studies*, 35 (1990), 265–82.

II. Locke's attitude toward the problems posed by biological generation developed in stages with the first dating from his years at Oxford. As this time is well-documented, it is perhaps enough here to recall that it was during these years that Locke learned of Descartes's mechanical philosophy, took a course on chemistry from the German Peter Stahl, read medical works by Harvey, Sennert, and the Galenists, created a personal *Herbarium*, and of course became acquainted with Robert Boyle and his corpuscular science.[13] It is in the so-called 'Morbus' entry of 1666–7, a text written while Locke was known to have been reading Boyle's *Origin of Forms and Qualities*, that we find an early response to the physical rendering of the 'plastic principle' at work in generation. In this short and unfinished set of remarks, Locke was interested in determining 'a more rational theory of diseases' based on the notion of seminal principles. As he defined them, 'by seminal principles or ferments I mean some small and subtle parcels of matter which are apt to transmute far greater portions of matter into a new nature and new qualities'.[14] Such principles, according to Locke, could perhaps explain the functioning of diseases since these too seemed to

[13] See J. W. Gough, 'John Locke's Herbarium', *Bodleian Library Record*, 7 (1962–67): 42–6, Peter Anstey and Stephen Harris, 'Locke and Botany', *Studies in the History and Philosophy of Biology and Biomedical Science*, 37 (2006), 151–71, G. G. Meynell, 'A Database for John Locke's Medical Notebooks', *Medical History*, 42 (1997), 473–86, J. R. Milton, 'Locke, Medicine, and the Mechanical Philosophy', *British Journal for the History of Philosophy*, 9 (2001), 221–43 and Guy Meynell, 'Locke as a Pupil of Peter Stahl', *Locke Studies*, 1 (2001), 221–7.

[14] Locke's 'Morbus' entry is reproduced in Jonathan Walmsley's 'Morbus—Locke's Early Essay on Disease' *Early Science and Medicine*, 5 (2000), 391–3; all citations are from 392, English modernized. Walmsley argues for the influence had by Van Helmont's philosophy on Locke's position here in contradistinction to Boyle's. See also J. R. Milton's discussion of Locke and Van Helmont in this context, 'Locke, Medicine, and the Mechanical Philosophy', *British Journal for the History of Philosophy*, 9 (2001), 221–43. Walmsley's view is contested by Peter Anstey and subsequently rebutted by Walmsley. See Peter Anstey's 'Robert Boyle and Locke's "Morbus" Entry: A Reply to J. C. Walmsley', *Early Science and Medicine*, 7 (2002), 358–77 and Jonathan Walmsley's 'Morbus, Locke and Boyle: A Response to Peter Anstey', ibid. 378–97.

transform the body's material into something new, that is, into the disease itself. Locke admitted that as to 'How these small and insensible ferments, this potent archeus works I confess I cannot satisfactorily comprehend' but he was clear that it could not be operating according to the mechanical procedures that had been suggested by Boyle for the 'straining' of particles by variously sized pores. As Locke saw it, only the transformative force of seminal principles could adequately explain the appearance of the 'hard and consistent parts of the chicken' from out of the 'soft and liquid' parts of the egg, and with respect to Botany, only seminal principles could make sense of plant generation at all.[15] Describing this transformative force, Locke noted that,

> ...this change seems wholly to depend upon the operation or activity of this seminal principle, and not on the difference of the matter itself that is changed, so several seeds set in the same plot of earth change the moisture of the earth which is the common nourishment of them all into far different plants which differ both in their qualities and effects, which I think is not done by bare straining the nourishment through their pores which in different plants are of different shapes and sizes.[16]

Regardless of how one is to interpret Locke's understanding of this 'potent archeus' at work as the transformative force in generation, what the 'Morbus' entry on disease makes clear above all is

[15] Locke makes use of neither 'metamorphosis' nor 'epigenesis' to describe the chicken's embryonic change from liquid to hard parts. Although Locke had carefully worked through Harvey's *De generatione*, taking care to note both Harvey's distinction between 'Metamorphosis' and 'Epigenesis' and his discussion of the efficient cause of generation (see Locke's notebook entries from 1659–60, MSS Locke f. 14, p. 1; f. 20, pp. 1–2, 4–5), it is not clear that Locke has this model in mind or even, *pace* Walmsley, is instead contrasting the Helmontian conception of a guiding 'archeus' to Boyle's conception of motion guiding fitted particles of matter into the chick. J. R. Milton takes 'Morbus' to represent an early eclecticism on Locke's part, see 'Locke, Medicine, and the Mechanical Philosophy', op.cit. 239.

[16] 'Morbus—Locke's Early Essay on Disease', op.cit. 392, English modernized.

Locke's early scepticism regarding a mechanically reductive explanation of generation. This early hesitation can in fact be seen to have continued throughout Locke's work even as his theories increasingly showed the influence of corpuscular science.

In 1667 Locke left Oxford for London where he became for many years a close associate of Thomas Sydenham. Sydenham, typically described as England's foremost physician of the seventeenth century, was also interested in the problem of disease and his widely-read *Observationes Medicae* attempted to provide a natural history of the various species of disease on the models provided by botanical systems of classification. Like Locke, Sydenham took diseases to function by virtue of some kind of transformative power, a capacity to change the body's humours through the processes of 'metamorphosis' into the disease itself. 'The said humours', as Sydenham explained it, 'become exalted into a *substantial form* or *species*; and these substantial forms or species manifest themselves in disorders coincident with their respective essences'.[17] Sydenham's examples of this process of 'exaltation' were always botanical, with mistletoe, moss, and fungi frequently cited as example cases of a tree's essence having been transformed into a wholly new species.[18] Sydenham believed that a natural system could be created on the basis of essential features in the plant kingdom, and he took his investigations into the various courses taken by diseases to represent a parallel attempt. In his view, a natural history of diseases on this model would be invaluable for it could form the backbone of a treatment programme once diseases were definitively recognizable.

[17] Thomas Sydenham, Preface to *Observationes Medicae*, at 106 in 'Locke and the Preface to Sydenham's *Observationes Medicae*', by G. G. Meynell, *Medical History* (2006), 93–110; translation of the Preface, 101–10.

[18] In the *Origin of Forms and Qualities* Boyle also appeals to mistletoe, in this case as an example against the supposed existence of a vegetative soul guiding the plant, Boyle 1991, 66.

The Preface to Sydenham's *Observationes Medicae* is considered to have been written either entirely by Locke or at least in close collaboration with him. But given that the Preface was published in 1676, i.e. during the time when Locke was already at work on drafts of the *Essay Concerning Human Understanding*, it seems clear that Sydenham's attempt to determine essential characteristics of disease would already have been at odds with Locke's emerging position on classification.[19] In a letter to Thomas Molyneux written after the publication of the *Essay*, for example, Locke was careful to distinguish the heuristic virtues of Sydenham's project—it could serve as an 'art of memory' for the physician—from the possibility that such a thing could actually offer 'philosophical truths to a naturalist'. As Locke developed the point,

> Upon such Grounds as are the establish'd History of Diseases, *Hypotheses* might with less Danger be erected, which I think are so far useful, as they serve as an Art of Memory to direct the Physician in particular Cases, but not to be rely'd on as Foundations of Reasonings, or Verities to be contended for; they being, I think I may say of all of them, Suppositions taken up *gratis*, and will so remain, till we can discover how the natural Functions of the Body are performed, and by what Attraction of the Humours or Defects in the Parts they are hinder'd or disorder'd. ...What we know of the works of Nature, especially in the Constitution of Health, and the Operation of our own Bodies, is only by the sensible Effects, but not by any certainty we can have of the Tools she uses or the Ways she works by.[20]

[19] Authorship of Sydenham's Preface has been attributed to Sydenham, to Locke, and to both together. See Guy Meynell's 'Locke and the Preface to Sydenham's *Observationes Medicae*', *Medical History* (2006), 93–110, and J. R. Milton's 'Locke, Medicine, and the Mechanical Philosophy', op.cit., esp. 229, n. 42. One complaint in the Preface already speaks to the problem of classification so far as the *materia medica*—compendiums of medicinal recipes—are said to lack utility due to the inconsistent theories of symptoms and disease guiding their organization, Preface, op.cit. 103.

[20] 'Locke to Dr. Thomas Molyneux, January 20, 1692', in *Dr. Thomas Sydenham (1624–1689)* by Kenneth Dewhurst (Berkeley: University of California Press, 1966), 179–80.

Locke's views here reflected the results of his discussion of taxonomy in the *Essay*, but before turning to the grounds he had provided for this position, it is worth recalling a few points regarding what we know of Locke's account of organic processes apart from the already cited comments made in his Morbus entry.

Like Boyle, Locke accepted seminal principles as at least a partial explanation for the original generation of both organic and non-organic species. As he put it in his *Elements of Natural Philosophy* (1698), 'All stones, metals, and minerals are real vegetables; that is, grow organically from proper seeds, as well as in plants'.[21] Given his medical training, Locke was also familiar with theories that did not rely on seminal principles when explaining generation: the mechanical account on the model of fermentation provided by Descartes, the epigenetic version offered up by Harvey, and the preexistence theories taken to be supported by Leeuwenhoek's discovery of spermatozoa in 1677. Among the competing theories of generation, preexistence theorists argued that God had produced every single organic life form at the moment of creation. Depending upon the strain of preexistence theory, the individual life forms were then said to have been either embedded in the crust of the earth until they were taken up with food, or to have been encased—the so-called 'Russian doll' model—within either the ovaries or testes. But wherever these individuals were located after creation, they existed as submicroscopic yet fully formed organisms, and the gestation of an embryo was thus really only a process of mechanical enlargement. Although there would be problems for the theory in the long run, in their first appearances preexistence theories had a large number of supporters in so far as they fit with the mechanical approach to nature. It was this theory, for example, which lay at the heart of Locke's exchanges with Stillingfleet regarding resurrection. Locke was sceptical regarding

[21] *Elements of Natural Philosophy*, in the *Works of John Locke*, 12th edition (London: C. and J. Rivington, 1824), iii. 319.

the account, above all because it seemed impossible to assert anything like a material identity between a submicroscopic individual and a grown man.[22] His own view was that organic generation consisted in the rearrangement of previously created particles. Generation, as he defined it in the *Essay*, was

> When a thing is made up of Particles, which did all of them before exist, but that very thing, so constituted of pre-existing Particles, which considered altogether make up such a Collection of simple *Ideas*, had not any *Existence* before, as this Man, this Egg, Rose, or Cherry, *etc.* And this, when referred to a Substance, produced in the ordinary course of Nature, by an internal Principle, but set on work by, and received from some external Agent, or Cause, and working by insensible ways, which we perceive not, we call *Generation* (II. xxvi. 2).

Generation thus described the process by which an unsorted aggregate of preexisting particles was organized into a specific existence, into 'this Man, this Egg'; how generation or the rearrangement of particles took place once the internal principle became active, however, was something Locke considered to be incomprehensible.

Locke was also familiar with botanical processes, for he had actively built up a collection of plants for his own *Herbarium*—a catalogue remaining one of the best preserved from that

[22] A large piece of Locke's second reply to Stillingfleet takes up the latter's use of Leeuwenhoek's discovery when discussing resurrection. Locke argues that while seeds are responsible for both the production of individuals and the continuation of species, there can be no sense to the suggestion that the preformed individual in embryo is materially identical to the adult ('Locke's Reply to the Bishop of Worcester's Answer to his Second Letter', in *The Works of John Locke*, iv. 319). Locke's response flows directly from his discussion of identity added to the second edition of the *Essay*, see especially II. xxvii. 3 and 6: it is the 'organization of life in several successively fleeting particles of matter united to it' that makes for continued identity; to suppose that it were matter alone would make it hard 'to make an *embryo*, one of years, mad, and sober, the same man' (*An Essay Concerning Human Understanding*, ed. Peter H. Nidditch (Oxford: Clarendon Press, 1975)). All Locke citations from the *Essay* will henceforth be cited in-text with book, chapter, and section number.

century—taking careful note of species, hybrids, and random mutations such as a blue flower appearing among the expected yellow. Compared to the general constancy of animal reproduction, Locke thus noted at one point that 'in vegetables we find that several sorts come from the seeds of one and the same individual as much different species as are allowed to be so by the philosophers'.[23] And he worked to keep abreast of the ongoing changes and debates in botany regarding the classification of particular species of plants, throughout this period, noting changes that had affected his own catalogue and meeting with horticulturalists to discuss the results.[24] Locke's early engagement with the problem of understanding natural processes—whether regarding the transformative power of disease, or the internal principle at work in generation—would combine to support his views regarding classification. In particular, it seems to have convinced him that classification should disentangle itself as much as possible from any kind of ontological commitments regarding the things being classified.

As described earlier, the main theoretical task facing classification practices in the seventeenth century was determining the criteria which would be used for sorting whatever objects were under view. Once this theoretical task had been accomplished, then it was supposed to be only a practical matter with respect to sorting these individuals into groups according to the criteria that had been set. The problem on the theoretical end, however, was the goal of trying to match one's criteria to nature's own divisions and thereby create a natural system. The problem on the practical end, was having invariably to deal with organisms—and plants were

[23] Bodleian Library, MS Locke f. 2, pp. 357–8.

[24] J. W. Gough details the contents of Locke's *Herbarium* in 'John Locke's *Herbarium*', op.cit. 42–6. For an extensive discussion of the circumstances surrounding Locke's collection practices and his creation of the *Herbarium* see Anstey and Harris's 'Locke and Botany', op.cit. 151–71.

particularly difficult in this way—which seemed indeterminate, that is, which showed characteristics placing them in two or even three separate categories at once. But while Locke understood the difficulties facing natural history, he also thought that these problems had mainly to do with the incorrectly perceived terms under which taxonomists were labouring. It was not obvious to him that nature should even be interested in maintaining boundaries between species, nor was it clear that with all the shape-shifting going on in the plant world, for example, that such boundaries could ever be meaningfully maintained. The natural system, as Locke saw it, was an unsupportable myth, and the sooner taxonomists recognized this fact, the more likely was it that classification might make some progress toward an adequate system.

Classification was a human practice meant for human ends, and the problem facing classification thus lay in a separate direction altogether since it was essentially tied to facts about cognition. All sorting was the 'Workmanship of the Understanding' (III. iii. 12), for Locke, and as such it was open to the vagaries of individual judgement as well; as he put it, it '*depends upon the various Care, Industry, or Fancy of him that makes it*' (III. vi. 29). For example, 'if the *Idea* of *Body* be bare Extension or Space', according to one person, 'then Solidity is not *essential* to Body: If others make the *Idea*, to which they give the name *Body*, to be Solidity and Extension, then Solidity is essential to *Body*. That therefore, and *that alone is* considered as *essential, which makes a part of the complex* Idea *the name of a sort stands for*', according to Locke, and in this sense, 'to talk of specifick Differences in Nature, without reference to general *Ideas* and Names, is to talk unintelligibly' (III. vi. 5). It was therefore the naming of things, or rather the annexing of a name to a particular abstract idea that one had formed, that alone determined species. The supposed real essence of a determined kind was ultimately unknowable, even in the case of mankind, and Locke pointed to comas, delirium, retardation, and

madness, all in the effort to undermine any sense that rationality might prove to be an exception to this fact (III. vi. 29).[25]

Because classification was driven by pragmatic considerations regarding communication and order, it did not make sense to assume that nature could be similarly invested in determining boundaries between species. As Locke made the point,

> Wherein then, would I gladly know, consists the precise and *unmovable Boundaries of* that *Species*? 'Tis plain, if we examine, there is *no* such thing *made by Nature*, and established by Her amongst Men. [...] So uncertain are the Boundaries of *Species* of Animals to us, who have no other Measures, than the complex *Ideas* of our own collecting: And so far are we from certainly knowing what a Man is; though, perhaps, it will be judged great Ignorance to make any doubt about it. And yet, I think, I may say, that the certain Boundaries of the *Species*, are so far from being determined, and the precise number of simple *Ideas* which make the nominal Essence, so far from being setled, and perfectly known, that very material Doubts may still arise about it (III. vi. 27).

It was in fact the 'very material doubts' arising from attempts to determine natural kinds which indicated at once not only the artificial nature of our classification system, but the actual imprecision of nature itself. In keeping with this, Locke repeatedly offered examples of hybrids, deformation, and even mythical creatures to make the point regarding both nature's plasticity and the impossibility that independently established categories could

[25] E.g. 'I think, there is scarce any one will allow this upright figure, so well known, to be the essential difference of the *Species Man*; and yet how far Men determine of the sorts of Animals, rather by their Shape, than Descent, is very visible; since it has been more than once debated, whether several human *Foetus* should be preserved, or received to Baptism, or no, only because of the difference of their outward Configuration, from the ordinary Make of Children, without knowing whether they were not as capable of Reason, as Infants cast in another Mould' (III. vi. 26).

ever make sense of that fluidity.[26] 'Nor let any one say', as he put it, 'that the power of propagation in animals by the mixture of Male and Female, and in Plants by Seeds, keeps the supposed real *Species* distinct and entire ... for if history lie not, Women have conceived by Drills; and what real *Species*, by that measure, such a Production will be in Nature, will be a new Question' (III. vi. 23). It was with respect to this natural fluidity that Locke resorted to the role played by 'life', moreover, when it came to understanding organic unity at all. As he described it, organic unity was maintained only in so far as the organization of parts could be collectively orchestrated by their partaking in a common life. 'That being then one Plant', he explained,

> which has such an Organization of Parts in one coherent Body, partaking of one Common Life, it continues to be the same Plant, as long as it partakes of the same Life, though that Life be communicated to new Particles of Matter vitally united to the living Plant, in a like continued Organization, conformable to that sort of Plants. For this Organization being at any one instant in any one collection of *Matter*, is in that particular concrete distinguished from all other, and is that individual Life, which existing constantly from that moment both forwards and backwards in the same continuity of insensibly succeeding Parts united to the living Body of the Plant, it has that Identity, which makes the same Plant, and all the parts of it, parts of the same Plant, during all the time that they exist united in that continued Organization, which is fit to convey that Common Life to all the Parts so united (II. xxvii. 4).

The concept of life served thus as a constantly unifying force within the 'insensibly succeeding Parts' of the plant (II. xxvii. 4). Life was more than the organism's 'collection of matter', because it was the

[26] See Locke's entry on 'Species' from 1677: 'in vegetables we find that several sorts come from the seeds of one and the same individual as much different species as those that are allowed to be so by philosophers'. Locke's journal entry from November 19, 1677 in *An Early Draft of Locke's Essay: Together with Excerpts from his Journals*, ed. R. I. Aaron and J. Gibb (Oxford: Clarendon Press, 1936), 99.

active principle generating an individual life, an identity so long as the parts were orchestrated together by it.[27]

But while Locke seems to have both respected the general irreducibility of organic processes, and demanded that classification be recognized as something that was entirely the 'workmanship of the understanding,' he was insistent that our ideas of substances stood independent of such complete workmanship. It was precisely because the 'patterns' of our ideas of substances lay outside us, according to Locke, that we could not achieve the level of certainty and coherence afforded either mathematics or our ideas of morality, religion, and politics. In these modes of thinking, the patterns or 'archetypes' lay within the mind itself (IV. i. 1), in the case of substances, our ideas were in some sense original to the substance itself. And it was in this vein—that is, in the distinction between substances understood to be really existing outside of us and ideas that do not—that Locke took it to be a matter of common sense for us to assume real differences in the 'internal constitution' of things (e.g., III. vi. 6, 9, 28), particularly as this fitted with his belief that such a 'real essence' bore a causal relationship to our sensible ideas.[28] For Locke, the reality of individuals was simply both

[27] It must be said that Locke followed this description of the life of plants with an account favourably comparing the workings of animal parts to the functioning of a clock. One can only speculate as to the grounds for his greater openness to living aspects of botanical processes, but his own experience with these had at least prepared him to be ready for surprises when it came to vegetable life.

[28] While imperceptible corpuscles are assumed to bear a causal relationship to the observed properties of any given thing, there is no sense in which these can be known, for not only are they insensible but our constitution prevents us from experiencing unsorted aggregates. We appreciate roses, for example, for their fragrance and colour and handle them gingerly both for fear of thorns and in deference to the delicacy of their petals; the experience of a rose, however, is in no way akin to that of a body conceived as a collection of corpuscles because the latter describes an experience one could never actually have. Locke does not seem to have perceived any tension between his appeal to an unknowable real essence and his account of the cognitive means by which experience was in fact constructed. But the relationship between these two views explains, I think, the appearance of apparent contradictions between claims, for example, that nature has a real constitution,

a given and distinct from arguments regarding the logic of classification.[29] As he wrote to William Molyneux,

> In the objection you raise about species I fear you are fallen into the same difficulty I often found my self under when I was writing of that subject, where I was very apt to suppose distinct species I could talk of without names. For pray, Sir, consider what it is you mean when you say, that *we can no more doubt of a sparrow's being a bird, and an horse's being a beast, than we can of this colour being black, and t'other white,* etc. but this, that the combination of simple ideas which the word bird stands for, is to be found in that particular thing we call a sparrow. And therefore I hope I have no where said, *there is no such sort of creatures in nature as birds*; if I have, it is both contrary to truth and to my opinion. This I do say, that there are real constitutions in things from whence these simple ideas flow, which we observ'd combined in them. And this I farther say, that there are real distinctions and differences in those real constitutions one from another; whereby they are distinguished one from another, whether we think of them or name them or no. But that that whereby we distinguish and rank particular substances into sorts or genera and species, are not those real essences or internal constitutions, but such combinations of simple ideas as we observe in them.[30]

For Locke then, 'there are things from whence ideas flow', and there are 'real distinctions and differences in those real constitutions', but these were not in any sense to be understood as providing the criteria for their subsequent sorting. Real essence could not be known, according to Locke, though its effects—the

and that the very notion of an internal constitution is incoherent in so far as it requires criteria for determining it.

[29] Despite his talk of abstraction and archetypes, Locke was not an idealist, and his materialist commitments were typically on view in such discussions. That aside, this kind of tension between one's experience of real individuals and the simultaneous acknowledgement of the artificial nature of species categories, continues to plague discussions in natural history to this day.

[30] Locke to William Molyneux, January 20, 1693, *The Correspondence of John Locke*, op.cit. 626.

existence of its external 'pattern'—could be somehow recognized when receiving material sensations. Thus while it was a matter of common sense to assume real differences between substances, this fact in no way affected Locke's conclusions regarding the actual process by which classification occurred. ''Tis true', he explained, that 'I have often mentioned a *real Essence*, distinct in Substances, from those abstract *Ideas* of them, which I call their *nominal Essence*'...

> But [real] *Essence*, even in this sense, *relates to a Sort*, and supposes a *Species*: for being that real Constitution, on which the Properties depend, it necessarily supposes a sort of Things, Properties belonging only to *Species*, and not to Individuals ... [for] there is no individual parcel of Matter, to which any of these Qualities are so annexed, as to be *essential* to it, or inseparable from it (III. vi. 6).[31]

Locke's species nominalism did not entail a lack of commitment on his part to the real existence of individual substances, therefore, but this commitment did not itself mean that Locke would ever agree that essential features could somehow be logically determined in the absence of criteria for sorting.[32] Locke was both a nominalist

[31] Cf. 'Whereby it is plain, that Men follow not exactly the Patterns set them by Nature, when they make their general *Ideas* of substances; since there is no Body [such as referred to by "Metal"] to be found, which has barely Malleableness and Fusibility in it, without other qualities as inseparable as those. But Men, in making their general *Ideas*, seeking more the convenience of Language and quick dispatch, by short and comprehensive signs, than the true and precise Nature of Things, as they exist, have, in the framing their abstract *Ideas*, chiefly pursued that end, which was, to be furnished with store of general, and variously comprehensive Names' (III. vi. 32). Locke's nominalism is at its most pronounced with respect to non-living substances so far as these seem to succumb to the demands of corpuscular ontology. See especially Locke's journal entry on 'Species', September 19, 1676, in *An Early Draft of Locke's Essay: Together with Excerpts from his Journals*, 83.

[32] Lisa Downing makes the point as well, arguing, for example, that an 'unsorted particular' could not count as a real essence for Locke 'since no distinction between essential and accidental properties is possible without reference to a kind'. In 'Locke's

regarding species determination and a realist in believing that there were inner features contributing to species as well. In a similar fashion, Locke was both comfortable with a mechanical portrait of animal functioning, and cognizant of the need for 'inner principles' and 'transformative forces' when it came to understanding the processes of organic life. And all of this contributed to Locke's views of nature and the proper task of classification alike.

Reviewing Locke's early considerations of organic processes against the backdrop of corpuscular ontology reveals his sensitivity to the problems facing Boyle in the case of organic life. While he remained committed to the essential features of corpuscular science, he was none the less hesitant in the face of a straightforward endorsement of mechanical accounts of generation. For the problem with that approach, as Locke summarized it in *Some Thoughts Concerning Education*, was that it 'leaves no room for the Admittance of Spirits, or the allowing any such Things as *immaterial Beings in rerum natura*: when yet it is evident that by mere Matter and Motion none of the great Phænomena of Nature can be resolved'.[33] Locke's attitudes toward nature were not

Ontology', *The Cambridge Companion to Locke's Essay Concerning Human Understanding* ed. Lex Newman (Cambridge: CUP, 2007). Anstey and Harris, by contrast, take Locke's active involvement in botanical matters to raise important questions against the presumption that Locke was a species nominalist: 'Locke's botanical activities link him closely with essentialist classificatory projects, whilst his interpreters, using the *Essay* as their entry point into Locke's views on species, seem uniformly to have taken him to be, if not a species nominalist, then at least highly skeptical of the essentialist program in biological classification in general', 'Locke and Botany', op.cit. 167. While they take the extended discussions of species in book three of the *Essay* to represent rather a 'moderate conventionalism' (168), for the reasons argued above I agree with the stronger reading of Locke's nominalism and I take it to be motivated in part as a result of precisely those empirical investigations Anstey and Harris see in their favour.

[33] *Some Thoughts Concerning Education*, edited by R. H. Quick (London: C. J. Clay and Sons, Cambridge University Press, 1902), §192, p. 168. Reading this passage, Rogers concludes that 'Locke's ontology, then, allowed room for spirits, and therefore appears to allow for the possibility of the spirits of the natural magicians', and he suggests, therefore, that 'Locke's rejection of the possibility of knowledge of the essences of

uncomplicated, at times presenting a blend of seemingly opposed commitments. But these were precisely the grounds upon which he could recognize the need to disentangle the epistemic, cognitive aspect of taxonomy from the attempt being made by taxonomists to create a natural system. In the end, it was this disentanglement that would both pave the way for Linnaeus's successful creation of an artificial system of classification, and open the door to its subsequent attack by Buffon and his followers. By the middle of the eighteenth century, natural history would be wrested from the hands of taxonomy, but this path could not have been laid without Locke's work to demonstrate the arbitrary nature of classification as a whole.[34]

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substances—material or spiritual—did not commit him either to the rejection of an ontology which could include active spirits, or, on the other side, to one that excluded the possible truth of Epicurean Atomism' in G. A. J. Rogers, *Locke's Enlightenment: Aspects of the Origin, Nature and Impact of his Philosophy* (Hildesheim: Georg Olms Verlag, 1998), 185–6.

[34] Phillip R. Sloan begins to trace the transition from Locke to Buffon in two excellent articles, 'John Locke, John Ray, and the Problem of the Natural System', op.cit., and 'The Buffon-Linnaeus Controversy', *Isis*, 67 (1976), 356–75.

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