An intellectual history of the inheritance of acquired characteristics before Darwin: readers and ideas

John Lidwell-Durnin

University College

University of Oxford

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Short abstract

In the 19th century, debates over heredity were fuelled by anecdotal evidence and special, unusual cases. Farmers, animal and plant breeders, medical writers and natural historians all took part in wider efforts to compile and arrange this production of evidence in order to tell different stories about nature, and the laws of inheritance. While many historians have claimed that 'the inheritance of acquired characteristics', an important theory about the laws of inheritance, was a widespread belief during this period, the means by which this idea became widespread have been overlooked by other historians. Recently, Bernard Lightman and Sally Shuttleworth have both argued that early-19th century efforts to create community-led scientific periodicals and publications were more constitutive of scientific practice than earlier historians have considered, while Pietro Corsi has argued that the industry of 'contributors' to periodicals, encyclopaedias and dictionaries during this period provides a means by which we can better understand readership and reception of popular scientific ideas. In this thesis, I argue that the evidence produced by practitioners and amateurs in support of the inheritance of acquired characteristics is an important means by which we can come to understand how the idea became a widespread belief, and an important part of how many people understood the workings and laws of nature. This thesis draws on a range of practical agriculture and gardening magazines, popular encyclopaedias, as well as from phrenological journals and temperance writings, many of which have not previously been included in the history of the inheritance of acquired characteristics. One important aspect of this increasing popularity came via the fact that many of the proponents of the inheritance of acquired characteristics found the idea provided a means by which familiar, religious understandings of the family, sin, and reproduction, were preserved. In an era of scientific activity that Adrian Desmond has depicted as materialist and radical, the 1820s and 1830s saw medical and scientific writers from different religious backgrounds, discovering immediate and significant biblical value in the idea that sinful habits and virtues acquired in life are transmitted to offspring.

Long abstract

This thesis is about the popularisation and production of an idea: the inheritance of acquired characteristics. In the early decades of the 19^{th} century, farmers, animal breeders, doctors, and the wider public shared a family of questions and anxieties concerning the laws of inheritance. Questions over whether injuries, mutilations, and bad habits could be transmitted to offspring had existed for a long time, but found renewed urgency in the popular and practical scientific press during this era. Likewise, widespread optimism about improvements in agriculture, gardening and medicine helped to create an expectation that improvements brought about in one generation of livestock, crops, or even persons, would be transmitted biologically to the next. Many historians have long credited the popularity of this idea to the reception of Jean-Baptiste Lamarck's ideas about transmutation. Others, such as Adrian Desmond, have argued that the inheritance of acquired characteristics was part of the 'radical Lamarckism' that began to permeate British intellectual culture in the 1820s. In this thesis, I follow historians of Lamarck such as Pietro Corsi and Walter Burkhardt in maintaining that the inheritance of acquired characteristics was a widespread idea independently of the reception of Lamarck. This thesis argues that in order to understand how, precisely, the inheritance of acquired characteristics became a widespread belief, we should look towards the contributions made by the wider reading public themselves that were put forward by practitioners and amateurs as observations of the law at work on their farms, in their gardens, or in their patients' families. These anecdotal stories and cases provide both a means of understanding how people came to view the inheritance of acquired characteristics as a scientific fact, supported by evidence and experience, and also a means of understanding how the machinery of popular science facilitated the participation and involvement of the wider public in the development of ideas.

In arguing that the wider periodical and popular science press played an integral role in the popularisation of the inheritance of acquired characteristics, I develop three key aspects across the thesis. Firstly, I stress the importance of the culture of observation and reporting that was developed within the communities formed by agricultural, gardening, and even phrenological journals. Secondly, I stress the important role played by the periodical press in turning these observations and reports into evidence, by bestowing on them authority and legitimacy – and in some cases, even investigating their authenticity. Thirdly, I maintain that the inheritance of acquired characteristics held special appeal to religious authorities. The inheritance of acquired characteristics became for some a means by which mankind's stewardship over nature and tendency to sinful degeneration gained scientific explanation, fueled by countless anecdotal stories and medical cases produced by veterinarians, farmers, nurserymen, botanists, and physicians. While promoted by many progressive and secular authorities, it also provided the means of preserving a Christian ordering of nature, and it gained prominence through the very channels of communication and diffusion that have often been construed by historians as instrumental to secularisation.

Many of the most ardent proponents of the inheritance of acquired characteristics also spent time as editors or key contributors to periodicals, serialised encyclopaedias, and treatises aimed at a wider reading public. In researching this thesis, I proceeded to identify five areas of activity: agriculture, gardening and botany, asylums and phrenology, physiology, and the temperance movement. Agriculture, gardening and botany, and asylums and phrenology, are crucially important because these formed three key sites where observations and reports were generated by practitioners. Physiology, meanwhile, was at this time in Britain a science of compilation, and it was in physiological treatises and serialised encyclopaedias where many of the most famous and important stories that supported the inheritance of acquired characteristics found inclusion. Finally, scientific temperance writing on the dangers of alcohol drew heavily from asylum reports, phrenological journals, and physiological treatises in order to make its case as to the dangers of alcohol to the future children of would-be drinkers. The periodicals and encyclopaedias that I draw upon have in many cases not previously been considered as part of the history of heredity, and supply a new vantage point from which to assess how the idea of the inheritance of acquired characteristics came to pervade British society. In order to gain a better understanding of the mechanics of the periodical and popular science press, I also use materials from The Society for the Diffusion of Useful Knowledge papers (held by the University of London), and the papers of John Churchill (held by the University of Reading).

Chapter overview

[1] William Youatt, heredity, and the transmission of peculiarities in livestock

This chapter argues that a rising professional class of veterinarians and animal breeders in Britain utilized agricultural periodicals and animal breeding treatises and textbooks to promote the inheritance of acquired characteristics as not only a tenable understanding of heredity, but one that could be manipulated for profit by breeders and farmers. I focus on the career of William Youatt, whose involvement in both the Society for the Diffusion of Useful Knowledge, and also the movement against animal cruelty within the Unitarian church, set him at the crossroads of physiological and theological concerns in the maintenance and breeding of domestic animals. Drawing upon his correspondence with the Society for the Diffusion of Useful Knowledge [SDUK], his periodical *The Veterinarian* and allied agricultural periodicals of the time, I demonstrate that Youatt played a determining role in the ideological structure of SDUK. Authoring a view of heredity infused with his own theological training as a former Unitarian minister, Youatt's production of his numerous treatises and periodical provided a means by which he could create a professional community that gave the inheritance of acquired characteristics pride of place in the explanation of the origin of animal illnesses, and also the history of domestication. This professional community, I argue, including veterinary practitioners such as William Karkeek and Thomas Pett, was not only in part validated by its theological elements, but was integral to the process by which animal stories and farming anecdotes could gain authority and serve as evidence in debates over the nature of heredity.

[2] Plant heredity and the inheritance of acquired characteristics: grafting, budding, and fortuitous accidents

In this chapter, I look at how debates over the cultivation, breeding, and acclimatisation of plants developed in both practical gardening magazines and encyclopaedias. I argue that we find the same emerging contest over authority in botany as can be seen in animal breeding during this time. Practical experience was essential, whether genuine or merely feigned on the part of the author or contributor. My approach in this chapter is to use gardening magazines, along with treatises and encyclopaedias written on plant cultivation in order to assess how debates over budding, grafting, and cross-pollination yielded a plethora of new cases and evidence for the inheritance of acquired peculiarities in cultivated plants. I first look at the publications of Joseph Banks and Thomas Andrew Knight that were intended for a wider, practicing readership. I then show how the readership that encyclopaedist John Loudon cultivated with his magazines and encyclopaedias challenged, at times, the authority of the Royal Horticultural Society and the idea that men with more status yet less practical experience could write authoritatively on the cultivation of plants. Next, I look at the botanist Joseph Lindley's relationship to the Society for the Diffusion of Useful Knowledge, and his collaborations with John Loudon as a further means by which the ideology of SDUK was asserted in the realm of gardening and botany. As in the case of domesticated animals, the production of encyclopaedias of gardening, and magazines driven by contributions from readers, were essential to informing the shape that the debate over heredity in plants took. Finally, I look at the botanical writings of the physician John Stevenson Bushnan, who found deep religious significance in the role played by the inheritance of acquired characteristics in shaping both the wilderness and cultivated plants.

[3] Asylums, the inheritance of acquired characteristics, and the phrenological press

In this chapter I move to consider the human case, particularly that of mental disease. Observing and reporting cases of family madness, or cases of mental disease where the habits of a parent or grandparent could be cited as a cause, cut across many moral and social conventions in 19th century Britain. However, *The Phrenological Journal* dedicated itself in part to the collection and diffusion of cases that could support the inheritance of acquired mental traits (both positive and detrimental), and many asylum doctors and medical writers contributed to its pages. While many of the authorities I look at in this chapter disagreed about what phrenology ought to be, they shared a belief that science should proceed in trying to understand hereditary insanity by compiling key cases. Asylum doctors, teetotal activists and physiologists sought to take advantage of reforms in medical patient certificates, asylum statistics, and knowledge of patient history in order to understand whether these conditions were hereditary, or could become hereditary once acquired. I hope to show in this chapter and the next that while the efforts to employ statistical analysis and investigate family lines in patients presented new sources of evidence in discussing heredity, this literature also provided a new space in which the idea that acquired peculiarities are transmitted to offspring could be perpetuated and gain new authority. I show that family histories were increasingly prioritised in the case studies of asylum doctors such as W.A.F. Browne and John Hayball Paul, and investigate how these family histories prioritised the transmission of acquired characteristics.

[4] 'Sifting, condensing, and sorting': physiology, evidence and the significance of compilers

Physiology, a constitutive part of the reforms in medical education that were taking part in mid-19th century Britain, was still an encyclopaedic science. When we assess the fortunes of the inheritance of acquired characteristics as a medical theory, the production of authoritative treatises and encyclopaedias that gathered and arranged evidence pertaining to heredity played a crucial role in bestowing legitimacy upon the animal stories and medical cases that I consider in earlier chapters. The chapter shows that the SDUK *Penny Cyclopaedia*, in its serialisation and in its efforts to maintain a unified theory of heredity across its disparate articles on disease and medicine, set a standard for medical writing that later figures – most crucially the physiologists William Benjamin Carpenter and Robert Bentley Todd – were keen to emulate. In this chapter I look at the popular physiology textbooks and treatises of William Benjamin Carpenter, including his involvement in Robert Bentley Todd's *Cyclopaedia of Anatomy and Physiology*. By critically analysing the presentation of heredity and illness in the *Penny Cyclopaedia* and *The Cyclopaedia of Anatomy and Physiology*, both of them serialised encyclopaedias with ties to SDUK, I argue that these publications played an instrumental role in validating the observational activity of generations of figures interested in the mechanisms of heredity. Secondarily, these publications, even when they were being produced in the 1850s, 1860s, and 1870s, were continuing to popularise and appeal to anecdotal stories about heredity that had first been reported decades earlier. Referring back to the discussion of Unitarian faith I develop in chapter one, I proceed to show that like William Youatt, Carpenter was deeply invested in reconciling his views on heredity with the theology of his peers within the Unitarian church, particularly James Martineau. By assessing the edits and revisions he conducts on his physiology treatises over the decades, I show that Carpenter becomes increasingly dedicated to the inheritance of acquired characteristics.

[5] Temperance literature and the inheritance of acquired characteristics

Many of the phrenologists I consider in Chapter Three also published and campaigned in the cause of temperance, and in this final Chapter I demonstrate that this production of temperance writing provided a further means by which the evidence of the inheritance of acquired characteristics was both diffused and put into practice towards a social aim. Further, in addition to being an encyclopaedic science, physiology was, in the middle of the 19th century, a science that was partly entangled with the temperance movement. Perhaps more than any other factor, the widespread conviction in the early decades of the 19th century that alcoholics not only suffered from an acquired illness (intemperance), but transmitted this illness to their offspring, served as a motivation for physiologists, phrenologists, and temperance advocates to gather together animal stories, gardening experiments, and patient case studies in order to defend the belief that habits acquired in life can and will become instinctive, inborn habits for the next generation. Many asylum reports and physiological treatises published in the early 19th century doubled as temperance literature; and temperance pamphlets and treatises were the means by which many of the stories and anecdotes gathered by figures like William Benjamin Carpenter continued their life within the medical and popular press. In this chapter, I return to William Benjamin Carpenter's career, placing it alongside the work of his sister, Mary Carpenter, whose treatises on poverty and education drew upon her brother's work in physiology, arguing for a synthesis of medical thought and Christian social reform. I conclude by arguing that, rather than appropriating medical thought on heredity to pursue a religious purpose, the inheritance of acquired characteristics, as understood and utilised by temperance writers, was already imbued with the Christian significance such authors found in within it.

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Introduction

Over the course of the 19th century, many people who took an interest in the practical and popular-minded scientific literature of their time adopted the belief that their livestock, their plants, and even their own bodies, were the direct product of the habits and experiences of the generation that had come before. The farming and gardening periodicals which were founded in the 1820s and 1830s contained numerous descriptions from nurserymen who believed that they could not only induce new habits in plants, but also that they could produce seeds and cuttings that preserved these new traits. Animal breeders claimed regularly in the pages of these periodicals to have witnessed calves and colts inherit mutilations from their parent stock. At the same time, the children of alcoholics, epileptics, and melancholics were viewed as possessing 'hereditary taint', even in cases where the malady of the parent was clearly the result of an injury or adopted habit. these ideas came to be known as 'the inheritance of acquired characteristics', a phrase which gained popularity from the 1820s onwards. For Daniel Pick, beliefs like these constituted what he termed "ghosts" that informed writing on degeneration; anxieties over individual plants, animals, and criminals were gradually displaced to society through a social-scientific discourse.[1] Contemporary to Pick, Adrian Desmond viewed the dialogue on the inheritance of acquired characteristics that emerged in early 19th century Britain as symptomatic of a wider radicalism and resistance to religious authority.[2] The inheritance of acquired characteristics has been linked by historians to the reception of Jean-Baptiste Lamarck, utopian

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1 D. Pick, *Faces of Degeneration* (London, 1989), pp. 10-11.
2 A. Desmond, *Politics of Evolution* (London, 1989), p. 60.

ideologies, anxieties over degeneration, the rejection of religious authority, and numerous other frameworks for investigating 19th century science. Other historians have provided an internalist understanding of the idea, trying to position it within the development of contemporary ideas of evolution. The historian Robert Young, in 1970, argued that the inheritance of acquired characteristics (which he refers to as 'Lamarckianism'), was "one of those immensely fruitful errors in the history of science."[3] Young viewed the inheritance of acquired characteristics as a critical stepping stone in the intellectual journey towards conceiving natural selection – a view that separated the idea from its social context. Very often, an enthusiasm to uncover early advocates of transmutation has occluded the significance and importance that debates over heredity had for doctors, farmers, and gardeners, not to mention temperance advocates, theologians, and political writers.

By the close of the 19th century, some of the most prominent biologists and scientific writers in Europe – August Weismann, Francis Galton, and Karl Pearson counting among their number – dedicated experimental and statistical work to disproving this way of thinking about heredity.[4] For historians of biology like Ernst Mayr, the refutation of the theory of inheritance of acquired characteristics was one of the crucial transitions into what he recognised as "uncompromising" selectionism.[5] Biology wasn't the only discipline that was greatly altered by its

3 R. Young, *Mind, Brain, and Adaptation in the 19th Century* (Oxford, 1970), p. 189.

4 The history of the conflict between 'Lamarckism' and natural selection has been well-documented. See R. Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behaviour* (Chicago, 1987). See also P. Bowler, *Evolution: The History of an Idea* (London, 2009). See also G.M. Cook, 'Neo-Lamarckian Experimentalism in America: Origins and Consequences', *The Quarterly Review of Biology,* 74, no. 4 (1999), pp. 417–37.

5 E. Mayr, 'Weismann and Evolution', *Journal of the History of Biology*, 18, no.3 (1985), pp. 295-329.

abandonment (however lingering) of the inheritance of acquired characteristics. The gradual refutation of the theory in medicine, in psychiatry and psychology, in eugenics, and in agricultural science is a key chapter in the histories of these disciplines.

Since its decline in the life sciences, historians have argued that the inheritance of acquired characteristics was part of common knowledge, and that it was believed by many people that had no interest or exposure to scientific elaborations of the idea. Historians such as Conway Zirkle, Richard Burkhardt, and Pietro Corsi have all argued that the inheritance of acquired characteristics was a widespread belief in the 19th century. This is an important claim, not only because it helps us to understand what people believed about themselves and the world that they lived in, but because it also raises questions about how engagement with scientific writings informed society. If we agree that the inheritance of acquired characteristics was a broadly accepted idea, then we need to raise the question of how this became, for many people, a scientific fact, one that described the laws of nature and was founded upon evidence. We also need to raise the question of what communities adopted this way of thinking about inheritance. How, precisely, do we account for the popularity that this particular understanding of heredity came to enjoy? Who believed it? Was it a radical idea that brought with it the appeal of progressive ideals, or were its ties to traditional and religious ideas of sin and inheritance more decisive in bringing it popularity? While many equate the inheritance of acquired characteristics with 'Lamarckism', other historians of science have, for decades, pointed away from Jean-Baptiste Lamarck and towards much larger forces at work in 18th and 19th century medicine, agriculture, and botany. However, no sustained investigation into how and why the idea gained prominence has been conducted.

Recently, Staffan Muller-Wille and Hans-Jorg Rheinberger have spearheaded an interest in the history of heredity on its own terms.[6] This wider research has shown that the early 19th century was a period of intense industry and debate over what mechanisms and laws governed heredity, conducted across agriculture, botany, medicine, race science, and social movements. For Muller-Wille and Rheinberger, heredity constitutes an ideology in its own right, underpinning science and society in the same way that other historians have positioned 'religion' or 'capitalism'. Muller-Wille and Rheinberger think that 19th century ideas of heredity were operating in the background of society, but that they were also dependent upon medical practice and the organisation of a plethora of scientific and amateur societies. My approach to the inheritance of acquired characteristics builds on their work. This thesis presents the inheritance of acquired characteristics as linked to deeper anxieties that pervaded early-19th century Britain, surrounding agricultural production and the health and integrity of the family. The need to come to a scientific understanding of the inheritance of acquired characteristics was driven by both an optimism about the promise of improvement in agriculture and medicine, and also the fear of deterioration and degeneration. Muller-Wille and Rheinberger, in their *Cultural History of Heredity,* do not place any particular importance on the inheritance of acquired characteristics over other

6 See, for instance, S. Muller-Wille, and H.-J. Rheinberger (eds), *Heredity Produced* (London, 2007). See also S. Muller-Wille, and H.-J. Rheinberger, *A Cultural History of Heredity* (London, 2012). Carlos Lopez-Beltran's influential 1992 dissertation *Human Heredity: 1750-1870. The Construction of a Scientific Domain* (PhD Dissertation, Kings College London, 1992). Also Lopez-Beltran's paper: C. Lopez-Beltran, 'Inheriting Erasmus' worries on Hereditary Ills: The Paths of Heredity within the Darwin Family', in D. Depew (ed.), *Darwinism Evolving,* London: 2011, pp. 228-244.

ideas of heredity in this period.[7] My approach is different: I argue that anxieties as to whether or not acquired characteristics were transmitted to offspring were the most immediate concern to animal breeders, plant breeders, and also to doctors and medical writers that focused on mental disease. In this thesis, I use agricultural, veterinary, and gardening periodicals, as well as popular encyclopaedias and popular treatises to understand how observations of the inheritance of acquired characteristics on farms, in greenhouses, and in hospitals were collected and transformed into evidence by ambitious editors and scientific writers of the era.

What role, precisely, did the collection and diffusion of this evidence play in the popularisation of this idea of heredity? In order to understand the history of the inheritance of acquired characteristics, we must attend to the evidence that was rallied in support of the idea. The anecdotes, unusual cases, and stories produced by readers and contributors are critical to our understanding of the history of the idea because it serves as a means by which we can approach the question of who believed in the idea, and also a means of assessing why. By focusing on the production and communication of observations of the inheritance of acquired characteristics, we can understand how the idea became part of a constitutive set of beliefs that underwrote experimentation and observation within agriculture, botany, and medicine.

Thus, this thesis argues that it is important to look at the evidence produced by practitioners in support of the inheritance of acquired characteristics because it helps us to understand the popularity of the idea. By prioritising the efforts made

7 Muller-Wille & Rheinberger attribute the influence of the idea largely to the reception of the ideas of Jean-Baptiste Lamarck. See Muller-Wille & Rheinberger (2012), p. 72.

by breeders, farmers, gardeners, doctors, and others to produce important observations worthy of printing and diffusion, we gain an understanding of how these communities were constitutive of the larger machinery of science. Periodicals like *The Gardener's Chronicle* turned Britain's gardens into potential laboratories, from which any lucky gardener might find themselves successful in creating a graft-hybrid, or acclimatising a tropical plant to British soil. The inheritance of acquired characteristics, I contend, was always a topic that necessitated public involvement because the public were the evidence. Further, I demonstrate that many people not only believed in the inheritance of acquired characteristics, but that they were convinced of the operation of the principle in their own immediate lives: in their gardens, their farms, and in their families. As ideas of heredity became increasingly important to 19th century scientific enquiry, so too were they becoming increasingly important to agriculture, medicine, and society.

The inheritance of acquired characteristics flourished because it was an understanding of heredity inextricably tied to a certain comprehension of scientific enquiry. There was widespread acceptance across various levels of scientific activity that *accumulating* cases – observations or instances of a phenomenon – was the first step at arriving new knowledge. A Baconian understanding of scientific method informed many of the periodicals and journals that began to elicit contribution and experimentation from their readers.

These were not the only spheres in which the theory of inheritance of acquired characteristics became part of a useful and active discourse. For many proponents of the inheritance of acquired characteristics, the idea held important religious meaning. This forms a third aspect of my argument. Religious authorities used this terminology to further social causes: abolition, temperance, education, and even cruelty to animals. The attractiveness of the inheritance of acquired characteristics to communities already familiar with ideas of sin and inheritance played a crucial , but often overlooked, role in its popularity.[8]

Thus, by examining the ways in which readers and their anecdotes constituted a significant part of the Baconian legitimisation of the theory, and by examining how practitioners and publications both scientific, commercial and religious used the idea of the inheritance of acquired characteristics, we can achieve a richer understanding of the contexts and mechanisms operating within science by which the theory gained widespread popularity in the period.

The inheritance of acquired characteristics and Lamarck

In putting forward this argument, I am also putting aside the role sometimes attributed to Jean-Baptiste Lamarck as the original proponent of the inheritance of acquired characteristics. The reception of Lamarck's ideas in Britain were, undoubtedly, one means by which some scientific authorities began to think in new ways about the inheritance of acquired characteristics.[9] However, as I argue in this thesis, most of the proponents of the idea that were active in Britain in the 1820s, 1830s, and even the 1840s, did not associate the inheritance of acquired characteristics (as they understood it) with Lamarck's ideas.[10] In the next section, I

8 This relationship has been hinted at before. Muller-Wille and Rheinberger have linked the relationship between the inheritance of acquired characteristics' popularity within medical explanation in Europe by drawing comparison with original sin. See: S. Muller-Wille, & H.-J. Rheinberger (2012), p. 100.

9 See Young (1970), pp.163-170. See also Richards (1987), pp. 92-94.

10 This point is also made by R.W. Burkhardt, when he writes “while it is true that Lamarck endorsed the idea of the inheritance of acquired characters and made use of it in his evolutionary theorizing, neither Lamarck nor his contemporaries treated this as Lamarck's 'signature' idea.”, R.W. Burkhardt, 'Lamarck, Evolution, and the Inheritance of Acquired Characters', *Genetics*, 194, no.4 (2013), pp. 793-805, p. 795.

review the significance of this theme in the historiography of Lamarck.

Because 'Lamarckism' and the inheritance of acquired characteristics are so intertwined in both the history of science and later 19th century thought, I set out in this section what is owed (and what is not owed) to the influence of Lamarck in telling the story of inherited characteristics. Following Corsi's work on the reception of Lamarck, I argue that while Lamarck did enjoy influence and recognition in Britain in the decades leading up to Darwin's publication of *Origin*, many of the key figures that I discuss in this thesis knew Lamarck first and foremost as a taxonomist and conchologist. The question of heredity that was being pursued by scientific writers in Britain was by no means also a question of speciation, and the effort on the part of editors and writers to compile cases that evidenced the inheritance of acquired characteristics had begun in earnest decades earlier, pioneered by figures like Thomas Andrew Knight and Joseph Banks. From the late 19th century through to the present day, historians have credited Lamarck with the popularity of the inheritance of acquired characteristics. Some of the credit Lamarck genuinely deserves; most of it he does not, and has been given to him because the scientific activity I discuss in this thesis has remained invisible (or under-appreciated) by historians focused on debates by the most prominent authorities in 19th century science. Here I identify two historiographical traditions concerning Lamarck and the inheritance of acquired characteristics. One identifies the reception of Lamarck with the diffusion of the inheritance of acquired characteristics in medicine, agriculture, botany, and natural philosophy. My thesis draws from the second tradition, which views the inheritance of acquired characteristics as leading a life of its own within these spheres of concern, a life which only subsequently became entangled with Lamarck's name at the close of the 19th century.

The notion that the inheritance of acquired characteristics owed its prominence in 19th century scientific thought to the efforts of Lamarck went largely unquestioned throughout the 20th century, but there were important exceptions. Conway Zirkle was one early voice that drew attention to the fact that the inheritance of acquired characteristics had enjoyed a rich history of support and study independently of Lamarck.[11] However, Zirkle was uniquely focused on the question of *where* Lamarck found the idea, continuing to place importance on Lamarck with regard to its subsequent fame. For Ernst Mayr, Lamarck viewed the inheritance of acquired characteristics as "a universally accepted principle," a reading that helped to establish the idea as a widespread, pervasive belief of Lamarck's era.[12] Burkhardt, in his work on Lamarck, also argued that the inheritance of acquired characteristics was not an idea that Lamarck invented or one that he claimed to have invented.[13] For Burkhardt, the inheritance of acquired characteristics was primarily associated with a wider interest in social progress that pervaded political and social thought in the late 18th and early 19th centuries, and he found threads linking Lamarck's own politics to this wider ideological context.[14] Corsi, in *The Age of Lamarck,* argued that Lamarck was not an isolated thinker, and that the mechanics he availed himself of to explain nature were in the air at the time of his writing.[15] For Corsi, the inheritance of acquired characteristics was a

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11 C. Zirkle, 'The Inheritance of Acquired Characters and the Provisional Hypothesis of Pangenesis', *The American Naturalist,* 69, no.724 (1935), pp. 417-445.

12 E. Mayr, 'Lamarck Revisited', *Journal of the History of Biology,* 5, no.1 (1972), pp.55-94, p. 79.

13 R.W. Burkhardt, *The Spirit of System: Lamarck and Evolutionary Biology* (1977; 1995), p. 1.

14 Burkhardt (1977; 1995), p. 5.

15 P. Corsi, *The Age of Lamarck,* trans. J. Mandelbaum (Berkeley, 1988).

non-controversial and popular idea available to Lamarck to modify to fit his own ideas about fluids and dynamics. These modifications have led Corsi to argue that Lamarck never really advanced the idea of 'the inheritance of acquired characteristics' as his contemporaries viewed it.[16] Michael Ruse would continue this wider line of interpretation in *The Darwinian Paradigm:* “Lamarck was committed to progress,” as Ruse puts it.[17] The inheritance of acquired characteristics was part of Lamarck's scientific environment, an idea that (once re-shaped to fit his own ideas about the behaviours of fluids) fit his worldview. Laurent Loison, meanwhile, worked to demonstrate that French authorities, and not merely the ones most familiar to British and American historians, were at work in France contributing to the legacy of Lamarck.[18] In particular, Loison has demonstrated the importance of Lamarck to the development of Louis Pasteur's ideas in the 20th century.[19] Bringing the French reception of Lamarck to the attention of British and American historians has been important, as the scientific thought conducted in Britain and America in the 19th century was not constricted by the language barriers that often define historical inquiry today. Finally, Jean Gayon has argued that Lamarck was primarily interested in how organisms came to be modified in the first place, and not interested in heredity itself.[20]

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16 P. Corsi, 'Jean-Baptiste Lamarck. From Myth to History', in E. Jablonka & S. Gissis, ed., *Transformations of Lamarckism: From Subtle Flids to Molecular Biology* (Cambridge, MA, 2011), pp.12-28, pp. 15-16.

17 M. Ruse, *The Darwinian Paradigm* (New York, 1993), p. 53.

18 L. Loison, “French Roots of French Neo-Lamarckisms, 1879-1985.”*Journal of the History of Biology,* 44, no.4 (2011): pp. 713–44.

19 L. Loison, J. Gayon, and R. M. Burian, 'The Contributions – and Collapse – of Lamarckian Heredity in Pasteurian Molecular Biology: 1. Lysogeny, 1900–1960', *Journal of the History of Biology,* 50, no.1 (2017), pp. 5–52.

20 J. Gayon, 'Hérédité des caractéres acquis', in P. Corsi, J. Gayon, G. Gohau, & S. Tirad, *Lamarck, Philosophe de la Nature,* (Paris, 2006), pp. 105-163.

However, just as in the 19th century there were numerous accounts of Lamarck's ideas, so too in the 20th century (and continuing into the 21st) there are multiple narratives of his influence and reception. Peter Bowler, in his *Evolution: The History of an Idea*, maintains that the popularity of the inheritance of acquired characteristics in the latter half of the 19th century is owed to the growing fame of Lamarck.[21] Fabio Zampieri, in his (2009) article on Jonathan Hutchinson, disease and heredity, assumes that the importance placed upon the inheritance of acquired habits from one's ancestors in 19th century medicine stems from Lamarck, and that much of the discussion over constitutions in the middle and later part of the 19th century assumed that constitutions were the product of evolution.[22] In the history of eugenics, historians often attribute an interest in the inheritance of acquired characteristics to a rampant 'neo-Lamarckism' that seemed to invade medical thinkers. Paul Crook writes that "Saleeby and Huxley were raising topical issues. Neo-Lamarckism ideas still flourished in medical circles, encouraging the view that environmental modifications could produce lasting genetic impacts."[23] Mark Francis, in his works on Herbert Spencer, has invested faith in Spencer's own explanation that his encounter with Lamarck in Lyell's *Principles of Geology* served to introduce him to the idea that would come to play a central part within his philosophical account of nature.[24] For historians who focus upon the debates over evolution in the latter half of the 19th century, the profusion of Lamarckians and neo-Lamarckians often leaves the nature of the relationship of 'the inheritance of

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21 P. Bowler, *Evolution: The History of an Idea* (London, 2009), p.11, p.86

22 F. Zampieri, 'Origins and History of Darwinian Medicine', *Quarterly Review of Biology,* no.84 (2009), p. 342

23 P. Crook, *Darwin's Coat-Tails, Essays on Social Darwinism* (Bern, 2007), p. 288.

24 M. Francis, *Herbert Spencer*: *The Invention of Modern Life* (London 2007).

acquired characteristics' to Jean-Baptiste Lamarck an unexplored assumption.

The reception of Lamarck's ideas of transmutation in Britain has often hinged on the question of *how far* his ideas extended beyond a small number of authorities, located in Edinburgh and other academic capitals. Andre Galera, drawing primarily from work by Corsi and Robert Richards, has traced the intellectual reception of Lamarck by Lyell and other prominent authorities in Britain and France, but does not consider whether the wider community of readers interested in science were sharing in this encounter with Lamarck's ideas.[25]As Corsi has shown, many people's first (and often only) encounter with Lamarck's ideas came through dictionaries and encyclopaedias.[26] Corsi points out that Charles Babbage, William Herschel, William Benjamin Carpenter, and Charles Darwin (along with Charles Lyell and William Whewell) all rejected Lamarckism; however, almost all of those that rejected Lamarck maintained an openness (or dedicated belief) in the transmission of acquired peculiarities. An important addition amongst those that rejected Lamarck is Robert Chambers. As his critics observed, Chambers rejected what he knew of Lamarck's ideas about the means of adaptation and transmutation.[27] These debates, while heated and conducted across medicine, agriculture, botany, and natural history, have often been neglected because they omitted any discussion of transmutation. Bill Jenkins, in his recent study of Andrew Combe's views on heredity, argues that Combe had little knowledge of or interest in

[25] A. Galera, 'The Impact of Lamarck's Theory of Evolution Before Darwin's Theory', *Journal of the History of Biology*, January, 50, no.1 (2017), pp. 53-70.

[26] P. Corsi, 'Before Darwin: Transformist Concepts in European Natural History', *Journal of the History of Biology*, 38, no.1 (2005), pp.67-83, p.70.

[27] R. Chambers, *Vestiges of the Natural History of Creation,* (London, 1844), p. 233; see also S.R. Bosanquet, *'Vestiges of the Natural History of Creation; Its Argument Examined and Exposed*, 2nd ed., London, 1845), pp. 31-32.

Lamarck. Jenkins claims instead that "the field of heredity was dominated at this time by three groups: stock breeders and horticulturalists, ethnologists and medical practitioners."[28] Rasmus Winther, in his (2000) discussion of Darwin and heredity, makes no mention of Lamarck, preferring instead to concentrate on the importance of external factors (environment and habit) to Darwin's notion of heredity.[29] While subtle, the shift away from diagnosing the 'Lamarckian' elements of Darwin's thinking is profound.

The reception of Lamarck becomes increasingly important to the debates over the inheritance of acquired characteristics after the publication of Darwin's *Origin*, but by the 1860s and 1870s, an increasing number of authorities viewed the inheritance of acquired characteristics as a mechanism of evolution, in addition to a mechanism of heredity. Thus, this thesis does not attempt to include focus on the reception of Lamarck – firstly because this has been extensively studied elsewhere, but secondly because, as many have argued, Lamarck was not widely associated with the inheritance of acquired characteristics in the early decades of the 19th century. In the next three sections, I develop three key aspects of my argument for how the inheritance of acquired characteristics did become a widespread belief during this time.

Observers and evidence: the contributions made by readers to the science of heredity

Since Conway Zirkle's original article, historians of science have perceived that other factors were at play in the popularisation of the inheritance of acquired

28 B. Jenkins, 'Phrenology, heredity and progress in George Combe's *Constitution of Man*', *British Journal for the History of Science*, 48, no.3 (2015), pp. 455-473, p. 457.

29 R.G. Winther, 'Darwin on Variation and Heredity', *Journal of the History of Biology,* 33, no.3 (2000), pp. 425–55.

characters than Jean-Baptiste Lamarck's reception. This thesis contributes a new approach to understanding how the inheritance of acquired characters fit into the practical (or proximate) concerns and goals of the wider public in Britain. As I stated above, the inheritance of acquired characteristics was a topic of scientific enquiry that necessitated public involvement because the public were the evidence. Their livestock, their fruit trees, and their family illnesses were, case by case, observation by observation, the grounds upon which the competing theories of heredity would be tried and argued for. From the practical perspective of finding material to fill the pages of the many periodicals that emerged in the early 19th century, the contributions of readers became an essential source of scientific content. As Sally Shuttleworth and Geoffrey Cantor have observed, the readers of science periodicals engaged both in reading and in providing the content.[30] In taking this position, I maintain that we cannot understand why the inheritance of acquired characteristics gained prominence in the early decades of the 19th century without looking to the problems in gardening, animal breeding, and medicine to which the inheritance of acquired characteristics provided a potential answer. Gregory Radick, in his discussion of the historical context of natural selection, distinguishes between the 'independence thesis' and the 'inseparability thesis' in order to characterise the different ways of weighing the significance of historical context to the emergence of scientific ideas.[31] Like Radick's treatment of natural selection, I view the inheritance of acquired characteristics as inseparable from its local context – in this case, the industry and practical concerns of the farmers,

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30 S. Shuttleworth, & G. Cantor, 'Introduction', in S. Shuttleworth & G. Cantor (eds)., *Science Serialized* (London, 2004A), pp. 1-17, p. 7.

31 G. Radick, 'Is the theory of natural selection independent of its history?', in G. Radick & J. Hodge (eds), *Cambridge Companion to Darwin,* (Cambridge, 2009), pp. 173-197, p. 179.

gardeners, and doctors who began to view their crops, their flowers, and their patients through the transforming lens of this idea. This is to take a contrary view to Trevor Pearce who, in his history of the idea of natural economy, has argued that the development of 'natural economy' occurred "relatively independent" of its social and political context;[32] but eliding the significance of the idea's unique socio-political contexts obscures the mechanisms by which it attained popularity. However, while there are important relationships between 'the inheritance of acquired characteristics' and thoughts about legal inheritance and the communication of wealth in the 19th century, these links have been developed elsewhere, and it is difficult from the sources I consider in this thesis to maintain clear and consistent influence the legal and economic spheres on this question of heredity.[33]

As Corsi (2016) has recently argued, the contributors to these periodicals, dictionaries, and encyclopaedias formed a community of readers exchanging ideas that help us to understand readership.[34] Throughout this thesis, I view contributors as providing a means of gaining an understanding of readership. The culture that periodicals maintained in the early decades of the 19th century of inviting amateur and practitioner participation, has provided a means by which we can gain some appreciation of how these publications addressed or fit into the worldview of their readership:

> Assessing the reading public is not an easy matter [...] Yet. From

32 T. Pearce, ' 'A Great Complication of Circumstances' – Darwin and the Economy of Nature', *Journal of the History of Biology*, no.43 (2010), pp.493-528, pp. 495-6.

33 For work on this relationship, see, S. Kuchler, 'Revisualising attachment: An Anthropological Perspective on Persons and Property Forms', in A. Pottage & M. Mundy (eds), *Law, Anthropology, and the Constitution of the Social* (Cambridge, 2004), pp. 234-249.

34 See P. Corsi, 'What do you mean by a periodical? Forms and functions', *Notes and Records of the Royal Society,* 70, no.4 (September 2016), pp. 325-341.

> Edinburgh to Palermo and from Lisbon to Saint Petersburg, sections of the reading public, very different in size and social composition, felt empowered to argue issues in literature and theatre, religion, philosophy, but especially medicine and the natural sciences, irrespective of their actual proficiency in any of the fields they read about.[35]

In prioritizing the role that readers played in contributing to the scientific theories that gained prominence and currency in their time, I am drawing upon a rich literature that has developed out of case studies in the 19th century. Simon Knell has looked to knowledge production in British geology, and one of the many points emerging from his study was the great complexity of museums, societies, amateurs, rail workers and gentlemen that constituted the field prior to the 1840s.[36] For Knell, these institutions provided new varieties of readership – as well as potential specimen collectors – that helped to promote the development of geology. In his study of Pasteur, Massiamo Bucchi showed that it was the lay readership who produced the meaning of Pasteur's experiments on anthrax.[37] Using Bruno Latour's terminology of 'networks' and 'feedback loops', Ralph O'Connor, building on Bucchi's ideas, has commented: "the mosaic of case studies in current scholarship confirms that popular science worked [in the 19th century], not as a one-way process of knowledge transfer, but as a heterogeneous network of cultural exchanges and feedback loops between different social groups."[38] Stephen Hilgartner (1990) argued that generalist publications provide a means of communicating for "social and political purposes within the scientific community."

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35 Ibid., p. 329

36 S. Knell, *The culture of English geology, 1815-1851. A science revealed through its collecting* (London, 2006).

37 M. Bucchi. 'The Public Science of Louis Pasteur: The Experiment on Anthrax Vaccine in the Popular Press of the time', *History and Philosophy of the Life Sciences,* 19, no.2 (1997), pp. 181-209.

38 R. O'Connor, 'Reflections on Popular Science in Britain: Genres, Categories, and Historians', *Isis,* 2, no.100 (2009), pp. 333–45.

[39] For Bucchi, these "can foster the inclusion or exclusion of actors or theories from the specialist's discourse, and it can make room for new interpretations or confer a different status on existing models by linking them to other public issues and themes."[40] Thus, from the 1980s onwards, numerous historians have worked to undo what we could call, following Bucchi, the 'traditional' view of science and its relationship to society.[41] Bucchi describes this 'traditional' view in the following terms: "the public discourse of science starts where scientific discourse ends. Once the task of producing 'pure', reliable knowledge has been accomplished, knowledge can be offered in a simplified form to non-experts."[42] In fact, given that most of the important observations that mattered to authoritative writers on animal breeding, family histories in medicine, and the cultivation of plants were taken from *well* outside the bounds of the scientific elite, ideas about heredity developed opposite to the 'traditional' view.

Observers and contributors are instrumental because they were producing observations that were turned into evidence by the periodicals and other printed media that published them. Evidence is, in itself, an important facet of how the inheritance of acquired characteristics, and this thesis is structured around the different varieties of evidence that different kinds of professional and practical figures produced. I am following a growing historiography around the means by which scientific evidence is produced and given authority. In *Nature Exposed:*

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39 S. Hilgartner, 'The Dominant View of Popularization', *Social Studies of Science,* 20, no.3 (1990), pp. 519-39.

40 M. Bucchi, *Science and the Media* (London, 1998), p. 386.

41 Some recent examples of this trend include P. White, *Thomas Huxley: Making the "Man of Science",* (Cambridge, 2003); and J. Morrell, *John Phillips and the Business of Victorian Science* (Aldershot, 2005). B. Lightman, *Victorian Popularizers of Science: Designing Nature for New Audiences* (Chicago, 2007), and also A. B. Shteir, *Cultivating Women, Cultivating Science: Flora's Daughters and Botany in England, 1760 to 1860* (Baltimore, 1996).

42 Bucchi (1998), pp. 3-4.

Photography as Eyewitness in Victorian Science (2013) Jennifer Tucker discusses the significant role played by amateurs and outsiders in the production of astronomical photography.[43] Closer to the period considered in this dissertation, Knell argues that amateur specimen collectors and small societies provided significant contributions to the shape and content of the science.[44] The science of heredity, like astronomy and geology in the 19th century, was dependent for its development upon a very broad base of activity on the part of gardeners, botanists, farmers, animal breeders, and medical doctors. The growth of these active community of readers and their contributions to periodicals and encyclopaedias produced the observational evidence that later constituted knowledge of heredity for figures like Charles Darwin, Francis Galton, and G.H. Lewes (to name a few). The activity of these often anonymous contributors provided the intellectual context not only to the larger works that historians of science have focused upon, but they also provide in many ways the real seat of 'experimentation' for their time

Tucker's discussion of scientific method in the 1830s and the introduction of photographic means is particularly instructive. Henry Fox Talbot's photographic process, put forward in 1839, linked photography with the Baconian system: the idea that understanding could only be reached through a process of compilation and accumulation.[45] Early photographers were "involved in a partnership with nature", with the images collected by early photographers being used to compile evidence for numerous scientific questions.[46] Crucially, natural philosophers

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43 J. Tucker, *Nature Exposed: Photography as Eyewitness in Victorian Science* (London, 2013).
44 S. Knell, *The culture of English geology, 1815-1851. A science revealed through its collecting* (London, 2006).
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46 Tucker (2013), pp. 18-20.

compiled photographs in the same way, as I detail in this thesis, that they compiled anecdotes and unusual cases reported in the agricultural and medical press. Geological specimens, cuttings, photographs, and cuttings of reports from agricultural magazines: these formed a constellation of evidence available to scientific communities who remained focused upon a Baconian progress of knowledge. David Hull has examined the priority given to induction and observation by Herschel, Whewell and John Stuart Mill, arguing that "No matter what methodological tenets one espoused at this time, they had to be described as 'inductive', and have as their source Bacon and Newton. Hypotheses were suspect." [47] The means of legitimising different varieties of evidence, however, was complex and embedded in different professional institutions. Animal stories and anecdotal cases that appear to the modern eye ludicrous or unlikely held genuine sway in the 19th century, provided that they had a pedigree that included the name of a trustworthy or eminent authority. Each chapter of this thesis works to uncover the means of legitimating evidence unique to animal breeding, gardening, medicine, and physiology. However, these different sites of evidence production are all pervaded by a Baconian goal: the pursuit of even more evidence. An interesting case or report always served as a reminder to the reading public that more such cases were needed.

The periodical press

Periodicals, journals, and popular encyclopaedias provided the cheap mediums through which stories and cases of the inheritance of acquired characteristics were

[47] D.L. Hull, "Victorian Philosophy of Science", in G. Radick & J. Hodge (eds), *Cambridge Companion to Darwin,* (Cambridge: 2009), pp.173-197, p. 179.

transmitted. These same periodicals established new knowledge communities, defined by concerns about animal breeding or seed selection or skull size, but all of them requiring readers to contribute interesting and topical content. Here, I am drawing upon Lightman's view on the evolving role that scientific periodicals played in the 19th century: "Before 1860, many of the scientific journals for public audiences encouraged their readers to participate in the scientific enterprise."[48] Lightman views the period after 1860 as one in which periodicals shift towards calling on the public to provide support for a scientific elite. At the same time, the scientific press before 1860 was creating a new means by which figures of authority – like Joseph Banks, president of the Royal Society – could find their ideas and their opinions under question from practitioners and amateurs. In his discussion of the Reform Act, Michael Brock has claimed that "The newspaper heralded change in the politics of Britain in 1820 much as the transistor radio did in those of Africa in the 1950s."[49] The metaphor can be extended from politics to science. In the early decades of the 19th century, periodicals arose to raise consciousness and create new communities of readers. They promised to make scientific ideas accessible and also to create forums where the experiences of their practicing readers could be accumulated. While the stamp duties kept many of these publications out of the hands of the literate poor, publishers like Charles Knight and the *Society for the Diffusion of Useful Knowledge* were fast trying to monopolize the market of producing the cheapest possible scientific literature.

A tremendous amount of historical work has been done on the proliferation of the (often unprofitable) journals, magazines and periodicals that were published

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[48] B. Lightman, *Victorian Populizers of Science* (London, 2009), p. 296.
[49] M. Brock, *The Great Reform Act* (London, 1993), p.17.

in the 19th century.[50] One crucial theme of this research (pursued by many historians in the field) is that crucial changes were occurring in the structure and content of popular science periodicals that mirrored wider changes in the conception of science.[51] With Adrian Desmond's exhaustive mapping of the transmission of what he terms 'radical' ideas, his 1989 *Politics of Evolution* was one of the first to systematically retrace the religious and political commitments of the physicians, scientists, theologians and writers that made up the cast of pre-Darwinian debates.[52] Corsi has compared Desmond's depiction of 'radical Lamarckism' to the reactionary writings of theologian William Whewell, arguing that Desmond has found too many radicals in Britain to be convincing.[53] Lightman still views this book as a turning point in the history of science, and his thesis highlights a number of Desmond's own key players (like William Benjamin Carpenter). I depart from Desmond's view that the key to the scientific print culture of this era was diagnosing the generation of writers as principally excited by the promise of the radical. Desmond seeks to understand scientific activity during this era as part of a wider social (and secular) movement towards democracy and revolution.[54] But conversations on heredity were no more tied to radical agendas

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50 Geoffrey Cantor and Sally Shuttleworth have both spearheaded the significance of periodicals in understanding 19th century science. See G. Cantor & S. Shuttleworth (eds), *Science in the Nineteenth-Century Periodical: Reading the Magazine of Nature*, (Cambridge: Cambridge University Press, 2004B). Case studies have also shaped this literature. See J. Schwartz, 'Out from Darwin's Shadow: George John Romanes's Efforts to Popularize Science in "Nineteenth Century" and Other Victorian Periodicals', *Victorian Periodicals Review*, no.35 (2002), pp.133–59. B. Lightman, 'Darwin and the Popularization of Evolution', *Notes and Records of the Royal Society of London,* no.64.1 (2010), pp.5–24. M. Turner, 'Companions, Supplements, and the Proliferation of Print in the 1830s', *Victorian Periodicals Review,* no.43.2 (2010), pp.119–132.

51 See S. Shuttleworth & G. Cantor (2004A), p.2.

52 Desmond (London, 1989).

53 P. Corsi, 'Before Darwin: Transformist Concepts in European Natural History', *Journal of the History of Biology*, 38, no.1 (2005), pp.67-83, p.71

54 Desmond (1989), pp.5-7.

and ideas than they were what we could call conservative and traditional ideas. Heredity was put forward in agricultural and gardening magazines as a potential mechanism through which improvement and perfectibility could be gained. But that was not its only theme. Heredity also was invoked to establish limits. It was a means by which the past – real or invented – regained control and influence on the shape of the future.

This material production determined the means and the form of communication that ideas of heredity would take. As the medical, agricultural, and botanical literature grew in bulk, with the same excerpts and lectures and experiments repeated and enumerated across all price points, the development of ideas about heredity did not follow any hierarchy of scientific activity, and it also confounds notions of class or readership that we might try to use to understand how some ideas about heredity flourished while others foundered. This thesis is not about the production, demands, and means by which this scientific literature was produced, as that has been dealt with elsewhere.[55] However, this material production determined the means and the form of communication that ideas of heredity would take. Due to the costs and delays in printing and the cost of the publications, dynamic scientific discourse was occurring in the periodicals and encyclopaedias aimed at practical breeders, gardeners and cultivators, and practicing physicians and asylum doctors.[56] And, as I discuss in Chapters One and

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55 See for example, L. McReynolds, 'The Origins of the Mass-Circulation Press', in *The News under Russia's Old Regime: The Development of a Mass-Circulation Press* (Princeton, 1991), pp. 11-29; O'Malley, Tom, and Clive Soley (eds) "Putting the Press into Perspective." in *Regulating the Press* (London, 2000), pp. 7–18. See also (referenced above), M. W. Turner. "Companions, Supplements, and the Proliferation of Print in the 1830s." Victorian Periodicals Review 43, no. 2 (2010), pp. 119–32. Withers, Charles W. J. "Encyclopaedism, Modernism and the Classification of Geographical Knowledge." Transactions of the Institute of British Geographers 21, no. 1 (1996), pp. 275–98.

56 See for instance, Nioclaas Rupke's discussion of Richard Owen's decision to publish some of his

Two, practical breeders and gardeners were not inclined to trust or believe the things they read about breeding and heredity in writings by scientific authorities who had no practical experience; the closeness of the discussion to commercial and practical concerns could invert the usual hierarchies of authority.

A further key aspect to understanding the scientific press at this time is that it lacked any tangible boundaries that would allow us to talk of distinct disciplines or subject focuses. Editors and writers worked freely on whatever carried their interest or promised financial reward. Physiologists like William Benjamin Carpenter wrote authoritative encyclopaedias on vegetable physiology, astronomy and zoology. Hewett Watson, whose education carried him from legal, to medical, to botanical studies, edited the *Phrenological Journal* before dedicating himself to his work in botany.[57] The veterinarian William Youatt had the same Unitarian theological education enjoyed by his schoolmate the Rev. Lant Carpenter, and Youatt worked hard to unify the ideas he met in veterinary medicine and theology. From a pragmatic perspective, I argue that it was seldom financially viable for such men to write on or pursue a single topic. Being a scientific authority on five or six topics paid more bills than authority on one or two. As James Secord and many other historians of science have urged, finances played a large role in determining the content that scientific publishers reproduced and distributed.[58] This is important because a key feature of this period lay in the universal applicability of

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key findings in serialised encyclopaedias in N. Rupke, *Richard Owen: biology without Darwin* (London, 2009). See also G. Dawson, 'Paleontology in Parts: Richard Owen, William John Broderip, and the Serialization of Science in Early Victorian Britain', *Isis*, no.103 (2012), pp. 637–67.

57 F. N. Egerton, *Hewett Cottrell Watson: Victorian Plant Ecologist and Evolutionist* (London, 2016).

58 See the discussion of the prints and accounts included in Secord's discussion of the distribution and popularisation of the infamous *Vestiges of the Natural History of Creation,* in J. Secord, *Victorian Sensation* (London, 2003).

anecdotes, animal stories, and case studies that provided observational proof of the inheritance of acquired peculiarities. Despite the importance of looking to botany, farming, and medicine as sites of activity producing evidence for the inheritance of acquired characteristics, many writers who aspired to authority in one of the listed domains sought to attain to authority in them all.

There are also plain, financial factors that count towards the argument that no meaningful distinction between elite and popular science can really be maintained in presenting a history of heredity. The archives from the key medical publisher in the 19th century, John Churchill, provide a number of compelling factors that together help to contextualise why 'usefulness' and 'general readers' were so important to scientific and medical publishers. The medical press, as the correspondence between Churchill and his authors attests, was kept alive by a readership composed of surgeons, physicians, rural doctors, and the general public. If Churchill did not believe that a given work would hold enough appeal to engage the public, he did not shy away from informing his writers that he would lose money by undertaking to publish their work. To one potential author, Churchill wrote: “my opinion is that the work is more calculated to advance your scientific reputation, and consequently promote your professional status, than repay commercially.”[59] Churchill did not equate works that increased the reputations of his authors among their peers with profit.

Churchill had always held ambitions to own all the prominent medical periodicals. In 1837, he had written to John Forbes hoping to become the publisher

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59 Papers of John Churchill (University of Reading), hereafter MS1393/M3-8 – see J. Churchill to Dr Williams, Feb 20th 1857, MS1393/M3/ 160.

of his new venture with Connolly, *The British and Foreign Medical Review*.[60] "I think I may add without presumption," he wrote, "that my relations with the trade and medical establishments are such as to ensure an increasing amount of advertisements for the Reviews."[61] The acquisition, as Churchill wrote to one of his authors, promised to greatly improve his reputation as a medical publisher.[62] Of course, as angry critics also pointed out, Churchill's interest in owning publications like *The British and Foreign* included a desire to influence the reviews contained within them towards the promotion of his own titles, but this was common practice.

However, the financial structure of Churchill's business meant that there was no scope to publish works that addressed *only* physicians, or surgeons, or some elite audience. There was no economic possibility of a science that was not 'popular science'. Churchill could occasionally publish a book to improve the reputation of his press, but the larger questions about the nature of life and the human body were ones whose financial lives determined the audience. Churchill often found that physicians misunderstood the financial rewards available to them through publishing (which were scant) and that the reviews they read in *The Lancet* did not necessarily entail great numbers of sales.[63] While often overlooked by historians of science, the engravings that illustrated Churchill's publications comprised the greatest expense after paying his authors: an investment which reflects their necessity in driving sales.[64] Engravings also featured heavily in his strategy for

60 J. Churchill to J. Forbes, 26 Sep 1837 MS1393 / M3 / 56-7.
61 Ibid., p. 57.
62 J Churchill to J Crofar, Dec 1837 MS 1393 / M3 / 60-61.
63 J. Churchill to A. Walker, Jan 3rd 1848, MS 1393 / M3 / 157.
64 MS 1393 / M5-8 for John Churchill's ledgers, where he recorded the costs of publication and payment to authors.

advertising and selling works; Churchill (and other publishers) frequently boast the number of engravings in their advertisements.[65]

The inheritance of acquired characteristics and religion

In addition to radical secular ideas, 19th century Britain also was home to radical religious ideas. Just as science was enriched by the language of the inheritance of acquired characteristics, so too was religion. Young described the periodical press of the 19th century as presenting a homogeneous Christian theology, a view that has since given way to appreciating how different religious sects and denominations used periodicals in this period to construct their own communities.[66] A key aspect of understanding the popularity of the inheritance of acquired characteristics in early 19th century Britain involves appreciating the religious significance that many authorities found in the idea. The interest that the inheritance of acquired characteristics held for figures grouped under historiographical concepts like 'radical' or 'progressive' or 'secular' has often overshadowed the strong appeal that the idea held for authorities with religious convictions. As John Topham has argued, religious periodicals vastly outsold practical and scientific periodicals during this period.[67] When asking whether religion played a role in the popularity of the inheritance of acquired characteristics, it is important to remember that religious ideas had far greater appeal to the reading market than scientific ones. Evelleen Richards, recently, pointed to the fact that while radical figures did argue

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65 James Secord highlights the importance of illustrations in the success of *Vestiges* and in the wider culture of scientific publishing in the 1840s. See J. Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation* (Chicago, 2000), p. 444.

66 See J. Topham, 'Science, Natural Theology, and the Practice of Christian Piety in Early-Nineteenth Century Religious Magazines', in S. Shuttleworth & G. Cantor (eds), *Science Serialized* (London, 2004), pp. 37-67, p.39.

67 Ibid.

for the inheritance of acquired characteristics, they shared the employment of this terminology with others:

> The congruity of the widespread belief in the inheritance of acquired characteristics with ideologies of self-help and social improvement and the benefits of education has been well documented. At one end of the spectrum, they might find expression in the adaptation of Lamarckian evolutionism to radical/democratic ends in the rhetoric of disaffected marginal medical men, artisans, and the emergent working class.[68]

For Richards, the 'radical' end of the spectrum were not the sole users of the language of the inheritance of acquired characteristics. They shared the language and terminology with those that might be progressive, but also religious, and they shared it also with figures that were decidedly not progressive. I argue that this latter end of the spectrum is important to understanding how the inheritance of acquired characteristics became widespread, in a way that Lamarckian evolutionism or radicalism did not. While it did not emerge from Christian theology, the inheritance of acquired characteristics offered, I will argue, a means of seeing and experiencing nature that brought with it ideas familiar to a Christian society. The bible passage most commonly associated with the inheritance of acquired characteristics was *Numbers* 14:18:

> The Lord is long suffering, and of great mercy, forgiving iniquity and transgression, and by no means clearing the guilty, visiting the iniquity of the fathers upon the children unto the third and fourth generation.[69]

The idea that the sins of the parent are communicated to the offspring – the importance it brought to the past informing the shape and constitution of the present and future – was attractive to a society positioned between the religious

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68 E. Richards, *Darwin and the Making of Sexual Selection* (London, 2016), p. 166.

69 Num. xiv.18.

and the secular. In arguing this, I will be drawing from Charles Taylor's recent work on secularisation and science. Writing on the topic of secularisation, Taylor contends that "it is probable that at the level of social imaginary, many Britons lived in these last centuries in a hybrid world."[70] The 'hybrid' element of this world, for Taylor, is composed of two different ways of experiencing the world available to Britons in the 19th century. The first is what we could call a more established, religious experience: a view of the relationship of humanity to nature as one pervaded by religion. The second, arguably newer experience of the world available, is the one argued for by Desmond: an experience of nature as mechanical and impersonal, governed by laws that work independently of any Creator or divine purpose. A strong thread in the history of science has viewed almost all scientific labour in 19th century Britain as promoting the latter experience, without much attention to whether or not these same scientific labours ever lent renewed strength to religion.[71] Taylor has held that this hybridity was a result of the emergence of institutions that escaped church authority.[72] To omit the importance that this understanding of nature held for many religious authorities – particularly the Christian significance that this idea came to hold – would be to overlook a principal means by which the inheritance of acquired characteristics became an easy and fluid way of looking at generation and heredity.

Methodology

This thesis argues that the inheritance of acquired characteristics, as an important

70 C. Taylor, *A Secular Age* (Chicago, 2007), p. 393.

71 There are exceptions to this trend of course. The most important example is R. Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behaviour* (Chicago, 1987). See also P. Corsi, *Science and Religion: Baden Powell and the Anglican Debate, 1800-1860* (Cambridge, 1988).

72 C. Taylor (2007), p. 393.

idea of the early 19th century, is inseparable from the wider social contexts of its time. As I have outlined above, these contexts have three aspects. The first is a wider culture encouraged amongst practitioners and amateurs across agriculture, gardening, and medicine, of observing and reporting interesting and unusual cases. The second aspect concerns the periodical press, and is focused on this unique time when science periodicals sought to foster and develop communities of practitioners, making progress in science through a vaguely empiricist culture of accumulating and diffusing important cases. The third aspect concerns the wider importance of the affinity between the inheritance of acquired characteristics and religious ideas about sin and inheritance already familiar to the wider public; for an idea of heredity that was built out of public involvement, this affinity becomes important to understanding how the inheritance of acquired characteristics became popular with a new generation of readers.

In researching this thesis, I first narrowed the focus of periodicals on those that represented sites of activity and production of observations. Agriculture and animal breeding, gardening and botany, and mental asylums form the three principal sites of activity. Secondly, many of the key authorities that wrote on their own views also spent time as editors of these periodicals. This was important in further narrowing the pool of periodicals, as it permits more discussion of how the goal of *eliciting* contributions from readers fit into the wider goals of the editors, and their views of how agricultural or gardening science (or phrenology) ought to proceed as sciences. Following Corsi, I treat serialised encyclopaedias like the *Penny Cyclopaedia* and *The Cyclopaedia of Anatomy and Physiology* as serialised works in their own right. In order to understand the full history of the inheritance of acquired characteristics, the act of *compiling* these cases and stories is also crucial. In order to analyse this activity, in Chapters Four and Five I widen my consideration to include physiological and geological treatises as well as temperance lectures and treatises that included such compilations.

I also, in places, draw upon archival sources to better understand the print culture and the diagnostic procedures of some doctors. The best preserved materials relate to the publications from *The Society for the Diffusion of Useful Knowledge* (held at The University of London) and the archives of medical publisher John Churchill (held at the University of Reading). I also make use of the correspondence between William Benjamin Carpenter and Ada Lovelace (held at the University of Oxford), which pertains in part to Carpenter's composition of student manuals and popular encyclopaediasencyclopaedias, and archives of the Camberwell Asylum (held by the Royal College of Psychiatrists in London, and digitised by the Wellcome Library). Where possible, I have made efforts to utilise the archival resources in order to provide a material context for the proliferation and production of these texts, as well as to answer questions about readership.

I proceed by considering cases relating to animal breeding in Chapter One, cases relating to plants in Chapter Two, and the human case in Chapters Three, Four, and Five. It is important to begin with the plant and animal cases as it was far easier to trace the inheritance of characteristics across generations of animals and plants than it was human families. In Chapter One, I focus largely upon the career of the veterinarian and would-be zoologist William Youatt, who edited *The Veterinarian* and also produced a series of treatises on livestock for *The Society for the Diffusion of Useful Knowledge*. In Chapter Two, I focus on the careers of John

Lindley and John Loudon, who both edited gardening magazines that sought to elicit evidence from their readers to answer key questions concerning acclimatisation and graft-hybrids. Gardening was an important site for the production of evidence of the inheritance of acquired characters, although the phrase 'inheritance of acquired characters' was not widely used by gardening and botany authorities in the period I consider. A different language and terminology was used, relative to the practical goals and concerns of practitioners in gardening and plant breeding.

In Chapter Three I move to the human case. The medical press in Britain was one that clearly enjoyed a professional readership, both active in contribution and more clearly defined than the readership that editors like Youatt or Loudon sought to foster during the same era. There were also a vast number of medical conditions regarded as hereditary. However, no family of conditions compared to mental disease in their importance to the inheritance of acquired characteristics. These were the cases and stories that were important to the temperance movement, and which informed the asylum doctors that began to view their patients as evidence of hereditary insanity. More importantly, many asylum doctors also identified during this period as phrenologists (of one stripe or another), and *The Phrenological Journal* provided a space in which both doctors and members of the wider public could submit cases of the inheritance of acquired characteristics. By focusing upon phrenology and *The Phrenological Journal,* the importance of practitioners and amateurs in the wider scientific community is maintained.

Chapters Four and Five look at the importance of compilation: the activity by authorities in science and in the temperance movement whereby many of these stories and cases were gathered together and presented as linked and unified cases: evidence of the activity of one natural law. Chapter Four focuses upon physiology, both as presented in serialised encyclopaedias and also as presented in the treatises of Carpenter, a particularly important source due to his incessant efforts to revise and reissue his books. Indeed, Carpenter's revisions provide in themselves a good reflection of the increasing fortunes of the inheritance of acquired characteristics during this period. Finally, Chapter Five turns to the temperance literature that many of the authorities considered in Chapters Three and Four produced. This final chapter is particularly important in representing the importance of the religious context to the diffusion of the inheritance of acquired characteristics.

Many of the periodicals I consider in this thesis have never been examined as part of the history of the inheritance of acquired characteristics. By drawing upon these sources, a new understanding of what it means to say that the inheritance of acquired characteristics was a 'universal' or 'widespread' belief is realised. Previous historians have claimed that the wider public believed these things, but this thesis is the first to appeal to the contributors to periodicals and encyclopaedias in order to gauge who really believed in the inheritance of acquired characteristics during this period, and why. By focusing upon the production of evidence, this thesis also answers questions about how the inheritance of acquired characteristics moved from being a vague, pre-theoretical idea about resemblance between generations, and became a scientific opinion – something that people could assert was a scientific belief, founded on fact and evidence. This transition was not a matter of top-down mechanics, where an elite scientific base informed wider communities of natural law; but rather, it came about through these knowledge communities' engagement with scientific practice, and the production of the stories and anecdotes that would, by process of accumulation, come to inform the wider understanding of nature.

Chapter One: William Youatt, heredity, and the transmission of peculiarities in livestock

Introduction

In the 18th century, Britain became home to a plethora of agricultural magazines and societies aimed at the improvement and cultivation of livestock. One of the principal justifications for the creation of these societies was the promise of improvement, the idea that a community of farmers and breeders that shared experiences and methods would promote knowledge of animal breeding and rearing more quickly. Such societies, of course, could not escape a tendency to confirm what was already known amongst their numbers. Indeed, as I will argue, the inheritance of acquired characteristics (or peculiarities) gained legitimacy through the gathering of observations and evidence that such societies and periodicals encouraged. A practical theory of breeding could only ever be based on the experiences reported by practitioners: and the inheritance of acquired characteristics, as a belief that informed breeding methods in the 19th century, was at once something that everyone seemed to believe, and also an idea perpetually in need of more evidence and more practical support. This chapter poses the following question: how does an animal breeder come to *see* an instance of the inheritance of acquired characteristics? I answer the question in two parts. Firstly, the proliferation of a scientific literature aimed at encouraging both scientific practice and the gathering of evidence from 'experiments' in breeding and animal management fostered this new way of seeing. But the attractiveness of the inheritance of acquired characteristics to religious breeders, farmers, and veterinarians also played a large role. Following Charles Taylor's framework, what made it possible for the people who composed these communities (at any level of influence) to feel that they had observed the law at work in their livestock, or their families? Provisionally, I argue that the promise of stability, regularity, and the reliability of the adage 'like produces like' contributed in a large part to the popularity of this way of viewing generation. Crucially, the inheritance of acquired characteristics, far from conflicting with a biblical view of nature, found easy harmony with many popular themes in Christian teaching: the inheritance of original sin, the taming of nature, and the position of mankind as steward and shepherd of nature all found harmony with the teaching that 'peculiarities' acquired in life, for better or worse, would be passed down to offspring. Religious breeders and veterinarians found a familiar morality within the idea.

The cultivation of livestock in Britain, in the first decades of the 19th century, from the selection of hunting dogs and racing horses to improving the wool of sheep in Leicestershire, was undertaken with a newly-politicized hope that domesticated species could be physiologically altered and improved upon by the breeder. The belief that selective breeding could improve and enhance desired traits was by no means new – Robert Bakewell, at the close of the 18th century, had demonstrated with his own breeding practices with his Leicestershire herds that desirable traits could be strengthened and improved upon by breeding in-and-in, but not by breeding two animals that merely shared the desired trait.[73] As I will

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[73] A great deal of studies on Bakewell were written in the 20th century. See R. Trow-Smith, *A History of British Livestock Husbandry, 1700-1900 (*London, 1959). See also more recent studies such as D. Wykes, 'Robert Bakewell (1725-1795), of Dishley: Farmer and Livestock Improver', *Agricultural History Review, no.*52 (2004) pp. 38-55. See also M. Derry, H*orses in Society: A Story of Breeding and Marketing Culture, 1800-1920* (Toronto, 2006).

elaborate further below, 'breeding in-and-in' and 'crossing' were competing theories on how best to breed methodically, though in practice many farmers applied both. To 'breed in-and-in' could refer (confusingly) to two distinct approaches that were never successfully untangled in the literature. The first meaning was to breed siblings, cousins, or parent with offspring, in order to strengthen a desired trait. The second meaning was to breed two animals that shared in having the desired trait, irrespective of their family relation. While we lack a proper record of Bakewell's own practices, the former meaning is more prevalent and by all chances closer to the actual practice.[74] By 'crossing', breeders sought to breed an animal from one breed or variety with that of another, in the hopes of creating a new variety or strengthening a breed that was beginning to deteriorate. 'Crossing' seldom yielded the desired effect, as I discuss at length below, but the two methods became heavily ingrained in social and religious debates over the day, and they also served to bring the question of the inheritance of acquired peculiarities to the fore.

Bakewell was but one of many gentleman authorities on breeding that were adding footnotes to the prevailing idea of the time, so far as concerned the mechanisms of heredity active in breeding, that 'like produced like.' But with the debates over the Corn Laws in Britain, the question of whether or not Britain could support itself in times of famine or war became a key topic of the farming and agricultural periodicals of the day.[75] A self-sufficient Britain, according to the

74 Bakewell wrote nothing for publication on his methods. A few letters survive which are treated in R. Wood, 'The Sheep Breeder's View of Heredity Before 1800', in S. Muller-Wille & H.-J. Rheinberger (eds), *Heredity Produced* (London, 2008), pp.229-251, p. 235. Most of Bakewell's methods are described in G. Culley, *Observations on Livestock* (London, 1786).

75 See for instance, Patricia James' study: P. James, *Population Malthus: His Life and Times* (London, 2013). See also: J.P. Huzel, *The Popularization of Malthus in Early Nineteenth-Century England: Martineau, Cobbett and the Pauper Press* (London, 2006).

popular interpretation of Malthus at the time, faced starvation without improved yields and population control.[76] The two ideas: firstly, that British agriculture must improve its yields and ability to feed a growing, industrial population, and secondly, that it was possible to improve the desired traits of domesticated animals, played out side-by-side in agricultural literature during the imposition of the Corn Laws. The prices that Bakewell could command for his own sheep also sent a strong financial signal to other breeders that the aid of science was fruitful.[77]

Aside from the commercial interests, there were also religious and cultural attitudes towards animals that informed agricultural ideas about breeding. As Radick showed in *The Simian Tongue* (2009), the European discovery and exhibition of the gorilla in 1861 in London created a series of timely debates over the difference between mankind and brute, coinciding with Max Muller's lecture where he propounded that the absence of language in animals represents an unbridgeable gap between the animal and the rational.[78] Radick has contrasted the views of Darwin and Chambers (the author of *Vestiges)* in the 1830s and 1840s to show that whereas Darwin was already adopting a gradualist view of the origin of language, looking for the precursors of morality and language in brutes, Chambers proposed an abrupt appearance of the language faculties in his *Vestiges.*[79] Following Radick, we can find other figures active in the 1830s, alongside Darwin, that took a

76 See Rudolph Binion's revisionist look at Malthus' actual views on the question of the outcome of times when there are 'more men than corn.' (R. Binion, 'More Men than Corn: Malthus versus the Enlightenment, 1798', *Eighteenth-Century Studies no.*32:4 (1999), pp. 564–69. Following Binion, it is important to distinguish the content of Malthus' own writings from the elaborations on Malthus that came to represent his worldview in the eyes of the public.

77 Wood, R., 'The Sheep Breeders' View Of Heredity Before And After 1800', in Muller and Rheinberger (eds), *Heredity Produced* (London, 2008), p. 232.

78 G. Radick, *The Simian Tongue,* (London, 2009), pp. 16-17.

79 Radick (2009), pp. 31-32.

gradualist view. As we might expect, the question in the 1830s was not one of evolution, but instead of the moral ties between humans and animals. The physiologist and veterinarian William Youatt's views on the affinities between man and brute, while deeply religious, were also set to inform and encourage the ability of both elite figures like Darwin and his wide readership to perceive important continuations between the animal and human realm. At the same time as lines were being drawn in the sand over the differences between animal and human minds, agriculturalists like Youatt were pioneering an unlikely blend of religion and physiology, hoping to convince a wider readership that mankind and brutes shared more common ground in the Creator's design than one might have otherwise believed. Such blending of religion and physiology, I argue, helped Youatt in his efforts to popularise his views on animal heredity: they enshrined them in a familiar worldview that didn't threaten a religious framework.

In this chapter, I give an overview of the state of general ideas about heredity that trafficked in agricultural letters in the early 19th century. I then turn to analyse how the newly-established Society for the Diffusion of Useful Knowledge [SDUK] sought to produce a scientific literature on animal medicine, care and maintenance that would be consumed by all levels of readers. As Youatt was keenly aware, efforts on his own part through SDUK to publish authoritative texts on animal breeding would need to appeal to a readership that prioritised practical experience over social position or scientific authority. The involvement of readers as contributors to agricultural magazines like *The Veterinarian,* I demonstrate, meant that without prioritising the significance of practical experience in deciding questions about the nature of heredity, Youatt's own publications could find themselves questioned and rejected by the very readership the Society hoped to foster. I then move on to show how Youatt's religious training and convictions provided a separate – but crucial – motivation for his belief in the inheritance of acquired peculiarities, and suggest that this played a pivotal role in shaping his veterinary and practical advice. Finally, I conclude by looking at how other authorities – particularly Alexander Walker – worked to promote the relevance of animal breeding to questions concerning human heredity.

'The breeder's fundamental belief': like produces like

What, precisely, did breeders and farmers believe about their practice at the start of the 19th century? Actual breeding methods and practices most certainly differed in practice from the advice and ideas contained in treatises and farming periodicals, but the agricultural press of this era pays testament to a widespread conviction that Britain's farmers and breeders must become literate in science. As Carlos Lopez-Beltran has argued, the significance of the word 'heredity' had not yet come into widespread use in Britain.[80] Staffan Muller-Wille, and Hans-Jorg Rheinberger both uphold the view originally put forward by Francois Jacob, that prior to the 18th century, religious and scientific ideas viewed generation as not reproduction, but as unique instances of creation, akin to the production of artefacts.[81] The very idea of 'inheritance', Muller-Wille and Rheinberger have shown, was largely absent from medieval and renaissance-era medicine, coming into occasional debate in the 17th and 18th centuries before becoming a foundational idea within writing on nature

[80] C. López-Beltrán, 'In the Cradle of Heredity; French Physicians and L'Hérédité Naturelle in the Early 19th Century', *Journal of the History of Biology*, no. 37 (2004), pp. 39–72. See also C. Lopez-Beltran, 'The Medical Origins of Heredity', in Muller-Wille and Rheinberger (ed.), *Heredity Produced* (London, 2008), pp. 105-155.

[81] See S. Muller-Wille, & H.-J., Rheinberger, *Heredity Produced* (London, 2008), p.16.

and generation. Indeed, the idea that humans, plants and animals *reproduced* themselves through having offspring was, in the early 19th century, only yet emerging. But that did not mean that there weren't already a variety of ideas about the laws of generation, shared by medical, scientific, and lay people.[82] The belief that children, calves and colts would grow to resemble their parents in both mental and physical attributes was assumed knowledge. "Like produces like," is a phrase that populates the encyclopaedias, medical treatises, breeding manuals, and gardening magazines of the first decades of the 19th century (and thereafter). When a farmer in Burford wrote to *The Farmer's Magazine* in 1841 to complain that his fellow farmers were not, like him, using the aid of science, he explained:

> Strictly speaking, this word (from *scio, scire, scirus,* knowing) means to know to a certainty– to be assured of an event or result to come, as of one that is past (unless prevented by some very unusual causes); as for instance, by the science of astronomy, we know the 'sun will rule by day, and the moon by night;' – of *geography*, that if we keep on sailing eastward, we shall come to the same point from whence we started;– of *natural history*, that if we put a bulb or seed in the ground, it will grow, and that like produces like.[83]

While Hugh Jemmett (the farmer in question) singled himself out as an enlightened farmer, it is telling that for him, 'like produces like' held the same authority as the laws of planetary motion and the roundness of the earth. It was established fact, 'known to a certainty.' Roger Wood, in his study on sheep breeders and heredity, remarks that 'like produces like' was a view long accepted, and that "it must be associated, in some mysterious way, with an animal's blood, the essence of life."[84] Sporting magazines on horses and temperament relied on the idea.[85] It was a

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82 See R. Wood, 'The Sheep Breeders' View of Heredity Before and After 1800', in Muller-Wille and Rheinberger (ed.), *Heredity Produced*. pp.229-251. See also A. Secord, 'Science in the Pub: artisan botanists in earl nineteenth-century Lancashire', *History of Science* no.32:3 (1994), pp. 269-315.

83 H. Jemmett, 'Theory and Practice', *The Farmer's Magazine* no.3 (January 1841), p. 138.

84 Wood, (2008) p. 229.

maxim that was routinely repeated by contributing farmers, animal breeders, and the editors of agricultural and gardening magazines – and it was often presented as the first and most important rule of breeding cattle.[86] The phrase had theological importance as well, in isolated cases being employed in theological manuals and treatises to explain the relationship of mankind to God. One Anglican pastor in Leeds maintained in his instructions to seminarians that: "As species propagates its kind, and like produces like, so whatever is generated by, or begotten of God, must be like unto God, possessed of the same nature or essence."[87] Other pastoral theologians of the 19th century occasionally interpreted Galatians 6:7-8, "whatsoever a man soweth that shall he also reap", as an expression of the natural law.[88] Just as the doctrine of evolution would inspire religious figures later in the century to try and adapt Christian ideas to new understandings of nature, religious authorities of numerous communities and denominations borrowed from the breeder's language to rephrase scriptural ideas already familiar to their audiences.

As a reader of *The Farmer's Magazine* and a farmer himself, Jemmett would have routinely suffered from the failure of this principle. The seeds from apples, nectarines, oranges, and pears do not produce trees that grow fruit like those taken

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85 See 'On Breaking Young Horses', *The Sportsmans Cabinet*, vol 1-2, 1833, p.351; 'Memoir of Gimcrack', *American Turf Register,* 2, no.7 (March 1831), p. 313; J. Lawrence, *The horse in all his varieties and uses* (London, 1829).

86 See for instance, instances of the phrase used by contributors to American agricultural periodicals in the 1830s and 1840s: 'Like Produces Like', *The Cultivator,* 3 no.2 (1846), p. 45. See also: 'A Hint on Potato Planting', *Maine Farmer,* 26, no.1 (May 13, 1858) p. 26. See also: 'Hints for the season' *The Cultivator*, 6, no.9 (1839), p. 145. See also: 'Saving Seed Corn', *The American Farmer*, 5 (Nov. 22, 1843), p. 214. See also: 'The Principles of Breeding Cattle', *The American Farmer*, 3 (Oct 13, 1841), p. 165. See also: J. Blake, 'Mixing of Potatoes', *The New England Farmer; a Monthly Journal,* 8, no.6 (1856) p. 291. See also: S.P. Chapman, 'The Principles of Breeding', *The Genesee Farmer,* 10, no.110 (1849), p. 110.

87 See for instance B.L. Hargeave, *The Exercises Proposed to the Candidates for Holy Orders at the First Ordination*, (Leeds, 1837), p. 17.

88 See for example, Rev. Porter, E. 'Probation', *National Preacher,* 1, no.14 (January 1840), p.1-9. See also: D, 'Signs Of The Times', *Christian Watchman*, no.5 (1844), p. 25.

from grafts. One cannot cross an Arabian horse with a Shetland and produce a breed that bears the best characteristics of both its parents. Stability in a variety is hard to maintain: cultivated varieties of fruit and domesticated animals, despite careful breeding, can lose their prized qualities over time. From the *Transactions of the Royal Society* to the *Penny Cyclopaedia*, authorities on plants, animals, and medicine recounted stories where not only did the characteristics of the parent fail to transmit to the offspring, but new, unexpected peculiarities emerged.

But it would be a mistake to assume that 'like produces like' was an idea that only trafficked between amateurs and practitioners. While Jemmett, a farmer, did not advance his writing career beyond letters to *The Farmer's Magazine*, prominent physiologists like William Benjamin Carpenter, one of the most prolific scientific writers of his time, also made use of the phrase 'like produces like' as expressing something certain, something known about the nature of all life, plant, animal, and human.[89] When Allen Thomson was hired by Robert Bentley Todd to write the entry on generation for his serialised encyclopaedia of anatomy and physiology in 1839, Thomson included 'like produces like' as the most obvious and important law of influence parents have on offspring.[90] George Henry Lewes, in his important essay "Hereditary Influence" (1856), reminds his readers when broaching the subject of variation that 'like produces like'.[91] When Darwin came to writing on the idea in *Origin*, he reminded his readers: "No breeder doubts how strong is the tendency to inheritance: like produces like is his fundamental belief."[92] Agricultural,

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89 W.B. Carpenter, *The Principles of Comparative Physiology,* (London 1839), p. 3.

90 A. Thomson, 'Generation', in R.B. Todd (ed.), *Cyclopaedia of Anatomy and Physiology*, (London, 1839), pp.424-480, p. 470.

91 G.H. Lewes, 'Hereditary influence, animal and human', *Westminster Review* no.66 (July, 1856), pp.135-162.

92 C. Darwin, *The Origin Of Species* (London, 1860), p.12.

gardening, and medical journals had produced this communal agreement on the law at a level recognisable to Darwin, an avid consumer of such publications. But so too had this print industry created a culture of viewing this law as posing a problem to the breeder and the physician alike: when, and how, does like produce like? Which peculiarities of the parent are inherited by the offspring; and what about acquired peculiarities, are those too, produced in the offspring? The fundamental belief in 'like produces like' had to precede the posing of the (scientific) problem: are the acquired peculiarities of the parent inherited by the offspring?

The Royal Society: the science of peculiarities

The focus of this chapter is upon the efforts of The Society for the Diffusion of Useful Knowledge, particularly through the activity of William Youatt, to establish itself as the dominant voice in agricultural practice. But SDUK didn't emerge from a vacuum, and The *Transactions* of the Royal Society had long served as a means by which interesting and instructive cases in animal breeding and wider questions about generation could be diffused to a wide (if limited) public. As Muller-Wille and Rheinberger stress in their *Cultural History of Heredity*, 18th century naturalists had already begun to make crucial distinctions between 'constant' properties of a species and those that varied in different regions and climates.[93] For zoologists, geologists, botanists, and physiologists, the word 'peculiarity' had a special meaning: it served to denote all those properties and characteristics that belonged to an individual but which were constitutive of a race, variety, breed, or a family line, but not a species. As I argue in this thesis, the dream of a science of heredity

93 Muller-Wille & Rheinberger (2012), p.4.

was, in the early 19th century, the dream of a method or family of methods that could control the introduction and propagation of desirable peculiarities in livestock, plants, and in some medical cases, in humans. A pressing question was over how peculiarities were introduced over generations, and what caused them to disappear – was this the work of climate, diet, habit; or was it a question of blood? The pursuit of cases that could be counted as evidence in favour of one side or another was a concern of numerous institutions and individuals; here I consider two early, important cases that were brought before the *Royal Society*, one arguing in favour of blood, the other of climate. What I hope to draw from the two cases is that a culture of *reporting*, of investigation into key cases, and subsequently an effort to enlist the produced evidence in support of one view of heredity or another operated at both the most eminent and the most practical levels of scientific societies.

In 1813, two letters were read at the *Royal Society* on the topic of the inheritance of peculiarities. One had been authored by David Humphreys (not to be confused with Humphrey Davis), a Revolutionary War Colonel who was deeply invested in the improvement of livestock in America. The second letter was from a surgeon at Westminster, Anthony Carlisle. Both were recently appointed Fellows of the Royal Society, an institution that had by 1813 established a long history of encouraging and promoting scientific inquiry into the human races, as well as the improvement of livestock.[94] The questions concerning the laws of heredity that Carlisle and Davy were touching upon had long histories in the Society; the role of climate in producing races being tied to the Society's own investment in the slave

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94 C. Malcolmson, *Studies of skin color in the early Royal Society,* (Abingdon, 2013).

trade in the 17th century.[95] Davy and Carlisle both put forward their letters as potentially resolving (or helping to resolve) long-standing questions the Society had posed and pursued. By the early 19th century, as rival publications began to compete with the *Transactions of the Royal Society* for scientific relevance and authority, the demand for evidence in support of competing ideas of heredity was growing. Joseph Banks, then president of the Royal Society, was deeply interested in the improvement of agriculture and, as discussed in the next chapter, helped with Thomas Andrew Knight to found the Royal Horticultural Society, with the explicit aim of communicating scientific farming principles to the British population. But new models of communicating and developing agricultural science were being implemented. Agricultural journals were calling for their readers to contribute their own breeding methods. A debate that had long been maintained by The Royal Society was quickly being taken up outside of its confines; but a culture of reporting and legitimating key cases was maintained.

In 1791, a farmer in Massachusetts, Seth Wright, discovered that a newly-born lamb had legs so short that it couldn't jump over fences. By in-breeding, Wright produced the 'otter sheep', a breed that was one of the key points of evidence for Darwin and virtually every other writer on the subject of heredity or evolution.[96] Twenty years later, David Humphrey, a friend of Joseph Banks, procured an otter sheep for dissection and sent its skeleton and a notice to the Royal Society. Humphrey noted that the breed had numerous deformities, but what made the breed interesting to science was the success of a breeding

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95 Ibid., pp.14-15, 61-63.

96 See for instance, M. Bartley, 'Darwin and Domestication: Studies on Inheritance', *Journal of the History of Biology*, no.25 (1992), pp. 307–33.

experiment that had often failed elsewhere. By in-breeding the offspring of the lamb with the original deformity, more were produced, having, as Humphreys said, "the same peculiarities." Breeding in pursuit of certain peculiarities (and to eliminate others) was a much sought after goal for practical breeders and aristocratic landowners alike, and accidental cases like that of Seth Wright became popular in part because they presented simple, straightforward cases where the laws of generation produced the desired result. "When both parents are of the true otter or ancon breed," Davies wrote, "the descendants inherit, almost without exception, their peculiar appearance and properties of form."[97] As Davies and many other writers used the term, 'peculiarity' signified a property of an animal or plant that was desirable or undesirable. But breeders and botanists did not normally use 'peculiarity' to talk about 'accidents of development' or 'accidents of growth'. "The singularity of form seems to be confirmed in the blood," Davies wrote, confirming that cross-breeding yielded what he called 'amalgated' varieties positioned between otter sheep and normal varieties.[98] Peculiarities and singularities, thus, were inherent in breeds, varieties, and races – part of the blood. They distinguished family lines of livestock, persons, and plants, and were the basis for the vast tomes classifying varieties of trees, roses, and cattle that were produced in Britain at this time.

Alcoholism was a peculiarity within medical discussions. So too was epilepsy. In the realm of plants, 'peculiarity' could stand for the quality of the fruit produced by a tree, or a plant's resistance to drought or damp. In the world of

97 D. Humphreys, 'On a new variety in the breeds of Sheep', *Transactions of the Royal Society* (1813), p.88.
98 Ibid., p. 89.

animal breeding, 'peculiarities' were the traits that the breeder looked to as breeding points. Habits, dispositions, moods, and mental traits were also viewed as peculiarities. Hence, the idea that these peculiarities could be transmitted from parent to offspring – even when acquired during the life of the parent – wasn't in any way tantamount to espousing transmutation or evolution. But the idea that the transmission of peculiarities could be controlled by scientific aids was a tantalising one for Britain's farmers, gardeners, and even its physicians and asylum doctors. “Farmers recognized no greater achievement,” Roger Wood suggests, “than to regulate the generative process, so as to preserve or create an ideal type.”[99] Perfectibility may not have been a tangible goal, but it was the ideal against which farmers compared and contrasted their breeding methods.

Political debates could bring new meaning and significance to case studies or stories about hereditary peculiarities that were traded in periodicals and encyclopaedias. In the 1830s, as the debates in Britain over slavery in the colonies and in America gained increasing volume, James Cowles Prichard was compiling evidence for his defence of the unity of the human races. Medical cases where physical peculiarities had arisen and then become hereditary were of particular interest to him, and amongst the hundreds of cases that made up his *Physical History of Mankind,* he included a famous patient of the physician Anthony Carlisle, the mathematical prodigy Zerah Colburn.[100] Zerah Colburn, remembered in Britain for his tour as a child, had supernumerary fingers and toes. As did his father. As did his grandmother. The physician who removed the extra fingers and toes, Carlisle, wrote a letter on the family that he addressed to Joseph Banks, which

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99 Wood (2008), p. 230
100 J.C. Prichard, *Researches into the Physical History of Mankind* (London, 1836) p. 245-6.

was read at the Royal Society in 1813 (the same year as Davies' letter on Otter Sheep).[101] Carlisle suggested in his letter that the peculiarity of the extra finger and / or toe that occurred in the Colburn family was most likely caused by the action of a law that also was at work in the domestication of animals and the cultivation of plants.[102] He traced the family back four generations, and included what was (for the time) an exhaustive medical genealogy of the Colburn family. But he also thought that families like the Colburns must provide a kind of clue to a law encompassing plant, animal, and human beings. "A few generations of wild rabbits," he suggested, "or of pheasants under the influences of confinement, break their natural colours, and leave the fur and feathers of their future progeny uncertainly variegated."[103] It was the first time that a family tree, laid out in a diagram by Carlisle, had sought to trace the transmission of a peculiarity that was intended to reveal the functioning of a natural law. With it came a strong assertion that Colburn's own peculiarities, however improbable, were the product of climate and society.

Carlisle was not the only physician to take an interest in Zerah Colburn. Andrew Combe and Franz Joseph Gall (including a third anonymous physician) all took plaster casts of Zerah Colburn's head, in order to measure bumps above his eyebrows that would correspond with his mathematical powers.[104] While the phrenologists did not also take casts of the father, the interest they had was also in accumulating another note-worthy case. Carlisle likened his patient Zerah to 'a

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101 A. Carlisle, 'An Account of a family having hands and feet with supernumerary fingers and toes', *Philosophical Transactions* no.104 (London 1814), pp. 94-101.

102 Ibid., p.100.

103 Ibid., p.101

104 An account of the casts is briefly given in: Z. Colburn, *A Memoir of Zerah Colburn; written by himself* (Springfield, 1833).

clue', and the choice of words might have been approved by Combe and Gall as well. Cases like Zerah's were clues that could fit into many different kinds of puzzles. Joseph Banks, when he received the communication, was interested in the acclimatisation of fruit trees and propagation by grafting. Zerah Colburn wasn't a clue that he fit explicitly into his own work, but the case must have interested him. Carlisle himself was suspicious of the inbreeding amongst the American aristocracy of his adopted home.[105] Zerah Colburn was, for him, a clue to understanding the propagation of monstrosities, and a particularly useful one insofar as Carlisle was interested in tracing peculiarities like supernumerary toes via the maternal and paternal lines.[106]

Prichard had no interest in fruit trees or immediate interest in tracing hereditary peculiarities to the male or female lines – for him Zerah Colburn was a 'clue' to the origins of the human races. But Anthony Carlisle's paper on the Colburn family enjoyed a richer life than this – it was copied and diffused through the periodical and encyclopaedic literature for decades, where it continued to function as a piece of evidence, a clue that could be used to work out many different puzzles. It also took the form of an appeal – seconded by Joseph Banks, the president of the Society – for more such cases, more evidence. In other words, Carlisle (and Banks) were encouraging members of the Society and beyond to look at their livestock, their plants, and their patients for cases that might also exhibit

105 See A. Carlisle's letter to A. Walker, quoted in A. Walker, *Intermarriage* (London, 1838), p.ii.

106 A description of the paper on monstrosities written by Carlisle is given in 'Proceedings of Philosophical Societies', *Annals of Philosophy* no.3 (March 1814), p. 228. See also the only historiographical work that has been done on Carlisle, by R.J. Cole, 'Sir Anthony Carlisle, F.R.S. (1768-1840)', *Annals of Science* no.8:3 (1952) pp. 255-70. Unfortunately, Cole omits Carlisle's relationship to the Colburn family, focusing instead upon his education and contributions to medical artifacts to the emerging museums of his day.

inheritance of acquired peculiarities. But whereas the *Transactions* was a publication far beyond the aspirations of many such potential observers, the wider world of agricultural and gardening magazines were also beginning to encourage readers to put the idea of the inheritance of acquired peculiarities to the test. To look for it in action amongst their livestock, plants, and patients. Thus, if we are going to understand the lives that stories like that of Zerah Colburn enjoyed in the scientific press, we must give equal weight to agricultural periodicals, gardening magazines, veterinary magazines, agricultural and botanical encyclopaedias. We must understand how the scientific print culture of the time proliferated and diffused the evidence of acquired peculiarities through all levels of readership.

Authority and the agricultural press

The inheritance of acquired characteristics was a point of investigation and debate within the *Transactions*. But as many historians of science have observed, the *Transactions* were expensive, slow to be published, and given the structure of the Society, the ability of practitioners and amateurs to contribute to the *Transactions* was largely omitted. Evidence for the inheritance of acquired characteristics that stemmed from the *Transactions* carried a lot of weight; but in the early decades of the 19th century, Benthamite ideas about an inclusive science, pushed forward by large communities of practitioners that made space for amateurs, held special appeal in agriculture. *The Society for the Diffusion of Useful Knowledge* (SDUK), allied with agricultural magazines like *The Veterinarian* and also with Charles Knight's *Penny Cyclopaedia*, made concentrated efforts to both foster and engage a wider community of breeders and farmers in the adoption and proliferation of agricultural knowledge. But the actual success of SDUK and publications like *The*

Veterinarian to succeed in this goal has long been a subject of dispute.

Within agricultural and farming periodicals, and within encyclopaedias and treatises aimed at practical breeders from this period, there is a debate over what kinds of experiences grant authority on the topic of heredity. James Secord has argued that breeders were outside of the scientific sphere, and that Darwin's own work and correspondence with breeders represented a remarkable foray outside of the remit of scientific activity.[107] Bert Theunissen has also used Darwin as a means to assessing the status of breeders and also of veterinarians in the early decades of the 19th century. It is Theunissen's observation that Darwin was very selective himself in choosing what breeders he corresponded with – in a sense, Theunissen tells us that breeders were of such a low status that it was up to Darwin to choose whom to make important for his own work (as it happened, Darwin favoured drawing from the breeding principles of pigeon farmers).[108] This distorts the actual influence and importance that practical breeders wielded in the agricultural press of the time. Following Bernard Lightman, the agricultural and veterinary periodicals of the 1820s through to the 1850s were pushing practical breeders, farmers, and readers to contribute to scientific enterprise. In a print culture where Malthusian concerns about sustainability and the improvement of farming were being promoted, the involvement of practical breeders in understanding animal heredity was prized, and became the goal of many editors and publishers.

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107 "Darwin brought the knowledge of the breeders to bear upon questions of science by assembling a remarkable network that ranged from horticulturalists to animal husbandrymen, from pigeon fanciers to beekeepers. While necessitating extensive forays outside the social and intellectual boundaries of the world of science, such an all-encompassing method stemmed directly from Darwin's indoctrination in the research traditions of his own natural history community." J. Secord, 'Darwin and the Breeders: a social history', in D. Kohn (ed.), *Darwinian Heritage (*Princeton, 2014), pp. 519-542.

108 B. Theunissen, 'Darwin And His Pigeons', *Journal Of The History Of Biology,* 45, no.2 (2012), pp. 179–212, p. 186.

In both Britain and America, there was a sense particularly amongst breeders that they were advancing knowledge in a discipline that had both practical and philosophical uses. And there was also a shared sense that they ought to take the reins in communicating their viewpoints. "There is nothing more mistaken than the general opinion of practical farmers, of their unfitness for writing," an anonymous correspondent wrote in *The Farmer's Register* of 1831.[109] "We are well experienced (at least) in the reading of agricultural journals, and can conscientiously declare that the pieces that are best perceived, and considered most valuable, have generally proceeded from the pens of men who at first could scarcely be induced to use them, from their too-humble estimate of their powers."[110] The dialogue between veterinarians, aristocratic breeders (like Robert Bakewell) and practical breeders (like Darwin's pigeon breeders), and farmers that felt they had observations worth communicating to their own community, was already structured by the time Darwin wanted to make use of the ideas and evidence that it was producing. But it was by no means clear to the readers of *The Journal of Agriculture* that a veterinarian had any authority to speak on how to breed and care for horses – indeed, it was still a point of departure for the editors to assert in 1838 that "We maintain that a veterinarian alone can write a really practically useful work on the general treatment of the horse."[111] This proliferation of scientific-minded publications created a new environment in which practical breeders and figures with greater ties to Britain's scientific network were competing for authority.

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109 'A note from the Editor of the Farmer's Register: On the influence of parentage on offspring, in breeding animals', *ABC Farmer's Register,* 1:4, (September 1833), p. 193.
110 Ibid.
111 'Stewart's Stable Economy', *Journal of Agriculture,* 9 (1838), p. 120

While Secord regards SDUK as a Whiggish failure to educate and politicise the working classes, the years before its demise in 1846 were ones in which many academics and medical men attached to the newly-founded University of London advanced many of their key ideas and publications.[112] While initially very successful, it became unable to maintain itself through its subscribers by the end of the 1830s. Secord has shown that Charles Knight's *Penny Magazine* was never financially viable. Like William Youatt's own periodical *The Veterinarian* (and indeed many other publications of the time), it was maintained and published for motivations beyond economic gain.[113] Adrian Desmond viewed SDUK as one of several "branches of the Benthamite teaching business."[114] Other branches included the Mechanic's Institute, but the life of these societies and institutions have often been encapsulated by a comment made by Lord John Russell, cited by both Desmond and Monica Grobel in her 1932 dissertation on the Society, that it existed for "the distribution and not for the discovery of knowledge."[115] The negative implication being that SDUK represented the diffusion of a static art, of potentially radical but nonetheless older ideas. Despite its very close association with the University of London (its secretary, Thomas Coates, also served as only one of two individuals at

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112 J. Secord, *Victorian Sensation* (2000), p.30-34.

113 See for example, D. B. Marti, 'Agricultural Journalism and the Diffusion of Knowledge: The First Half-Century in America', *Agricultural History,* 54, no.1. (1980), pp.28–37. Marti argues that the agricultural journals of America (like their compatriots in Britain) were employed as a means by which a scientific worldview could be communicated to practical farmers. While Marti's (1980) position on the top-down relationship such periodicals afforded is problematic, more recent studies on the 19th century periodicals have attended to how published letters and guest columns were deliberately afforded space in such periodicals in order to ensure that readers were constitutive in creating the content, and also contributing to the scientific views espoused therein.

114 Desmond (1989), p. 27.

115 Ibid., p. 391; see also M. Grobel, "The Society for the *Diffusion* of Useful Knowledge, 1826– 46" (MA dissertation, University College London, London, 1932), pp. 1-20.

the University of London who received a regular salary), it was not pushing scientific discovery forward. As I am arguing in this thesis, the scientific investigations into heredity necessitated distribution and diffusion of ideas, as the very debate and methods used to explore heredity were dependent upon more anecdotes, more cases, and more observations submitted from trustworthy sources. But in its early years, SDUK had little understanding of who was reading and consuming its materials. And its efforts to understand its own readership, while flawed and patchy, provide some insight into how it fits into the wider narrative.

Readership

Some records survive of SDUK's own efforts to gauge and assess its readership; and while incomplete, these do provide evidence that the *Society* enjoyed a diverse readership, supporting efforts by historians to understand SDUK as hoping to diffuse knowledge to *all* classes in Britain. In 1829, shortly after commissioning William Youatt to write his agricultural treatises, Thomas Coates sent out a 24-question survey to a series of gentlemen landowners of which ten responses survive. The survey was intended to fulfil a variety of purposes: it represented an early effort of the Society to gauge the financial condition of its potential readership, their literacy, their marital status and what sort of materials they read. By requesting the information be supplied by landowners, the information on the classes that the Society hoped to write for was hopelessly biased. The survey asked two questions relating to the intellectual lives of the agricultural classes. Firstly, what kind of knowledge and education did they usually possess, and what kinds of information were most needed or would prove most useful? And secondly, what kinds of books and reading material did they already consume? One respondent, who did not conceal his contempt for the goals of the Society, answered when asked what educational materials might be of use:

> The chief information they require is to be obtained in regular attendance to their daily duties; intercourse with the towns is decidedly prejudicial and the best mode of improving the condition of the peasant is to provide him with constant employment at such remuneration as can be equally maintained [....] enable him to respect himself, and appear in a decent garb once on Sunday at a place of worship where he may learn all else that he requires.[116]

But other respondents thought the Society's goals were worth more consideration, and tried to give their best account of what an agricultural readership was, and what sort of literature might suit it. Most of the respondents said that the only books possessed by the lower classes outside of town were the bible, the prayer-book, and local newspapers. Some also commented about the proliferation of illegal pamphlets. One responded, "The books most frequently to be found amongst them are trash pamphlets which some years since were supplied by Hawkers – occasionally something better is found in the houses of some of the thoughtful a few books of a better thinking class."[117] Some of the answers cited the positive influence of schools and charities as having increased the ambitions of the peasantry, so that one respondent even noted that the publications of the Society were known to his farmers, commenting that their reading habits were: "Very various, but not many nor in general well adapted. A better taste is evidently spreading and some of the publications of the Society are met with [...] among the higher class of agriculturalists those publications are commoner."[118] A prevailing notion that rural families were naturally less intelligent pervaded the responses;

[116] SDUK Coll. Special Topics / 52 / Agricultural Survey / Hale, George Webb.
[117] SDUK Coll. Special Topics / 52 / Agricultural Survey / Ball, John G. May 1833.
[118] SDUK Coll Special Topics / 52 / Agricultural Survey / Anonymous. Highland 1832.

but there were exceptions to this view as well, with one commenting that in his opinion, "they are superior intellectually to the inhabitants of towns of the same grade of society, from the more extended field of their own actions embracing a knowledge of many mechanical arts and materials therein employed – as followers of all descriptions of produce – farm stock – masters, etc etc."[119] The only opinion that the Society could take away from the responses was that there was by no means a waiting audience that had already identified what sort of books and topics were of interest and use. Indeed, if the survey had been meant to aid the Society to understand the term 'Useful', it must have felt daunted by the responses – a common theme was that the peasantry needed schools and organisations that catered to their immediate needs, not cheaply-produced books.

The attempt to assay the readership that the Society for the Diffusion of Useful Knowledge reached is complex – primarily because the Society conceived of itself as writing for a population that had never before had access to scientific or philosophical ideas, whereas the correspondence that they received shows a far more diverse readership – correspondents wrote to complain that their agricultural publications were too technical and difficult to read, others wrote to complain that the mathematical and mechanical treatises contained numerous errors – the correspondents provided (at times incredibly detailed) corrections and amendments.[120] A look at the subscription list shows that many non-contributing physicians, academics and gentlemen of letters received honorary copies of the *Penny Magazine*.[121] Other subscribers listed their professional addresses – men

119 SDUK Coll / Special Topics / 52 / Agricultural Survey / Anonymous.
120 See SDUK Coll / ANON / 1-33.
121 See SDUK Coll / Register of Subscribers. The computer at the Greenwich observatory, Thomas Ellis, received honorary editions. 15 Bedford Place (1837, entry 180), as did several physicians (Dr

working at the Custom House, the Bank of England, the Stock Exchange, and Somerset House feature in the 1837 register of subscribers.[122] The idea of what constituted 'useful knowledge' was one that the public wanted involvement in – and the Society received endless recommendations for topics from unknown authors that viewed the Society as (if not democratic) certainly something that necessitated the involvement and contributions of wider society.[123] Youatt conceived of the object of the Society to be "to reduce knowledge to the level of all classes." The wording is significant – because it implies that the writings of the Society were meant to appeal to everyone, and by no means merely those readers that formed the bottom of a literate hierarchy.[124] Youatt did not hesitate to complain to Coates that the project, thus conceived, was difficult to the point of impossibility when it came to subjects like physiology and anatomy, and he feared that his own writings failed to fully realise the goals of the Society.[125]

Aristocratic, Eminent, and Practical Breeders

The readership of SDUK publications wasn't merely a financial concern. They also held the power to accept or reject the knowledge put forward by such societies as genuinely authoritative. One reason discussions of heredity had to be more complex and allow for new sources of authority was that practical breeders were reading authorities like Bakewell and contesting their results in print. J.T. Tynum, addressing himself to the Royal Society as "a breeder of 15 years' standing" and an

B Malkin and Dr. Thomson, entries 194 and 201). The phrenologist John Elliotson subscribed to the publications but didn't receive an honorary subscription. (see entry 229). The Bombay Native Educational Society received donated copies.

122 SDUK Coll / Register of Subscribers / 90-126.

123 See SDUK Coll / Anon / 23.

124 SDUK Coll / Youatt to Thomas Coates. 30 March 1829, p. 2

125 Ibid., pp. 2-3

advocate of crossing (as opposed to breeding in-and-in) wrote: “I should very much like to know on what authority the opinion against form a new breed from a cross rests. [...] Who but Bakewell and Ellman ever produced a new breed?”[126] Tynum's complaint was that the authorities (he mentions Youatt, Bakewell, Clive, Spooner, “and other modern authors”) had not yet followed the efforts of practical breeders at crossing, and he spoke for many practical breeders when he questioned whether Bakewell's results indeed matched his method. “Such specimens did not exist in either breed [of sheep] a hundred years ago, therefore it is a legitimate conclusion that they were produced by the union of two separate races.”[127] Tynum invited inspection by the Royal Society of his own flock as evidence that crossing, as opposed to breeding in-and-in was the sole method that could introduce new breeds (presumably they did not take his invitation).

Tynum represented both the ideal reader and practising contributor to scientific agricultural letters, but it was a point of familiar contention at all levels in the community that authority had not yet been fully conceded to aristocratic breeders such as Bakewell. William Karkeek, veterinarian and editor of the agricultural publication *The Veterinarian*, hoped that practical breeding would be open to more instruction and influence from natural historians – but despaired that in citing natural historians as figures of authority on matters of breeding “we are now treading on forbidden ground, by interfering with the ‘knowing ones.’”[128] The disdain for practical breeders who would not yield to scientific authority

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126 J.T. Tynum, 'Original Correspondence', *Trewman's Exeter Flying Post* (Thursday, January 7th 1847), p. 160.
127 Ibid.

128 W. Karkeek, 'On Breeding', *The Veterinarian,* no.4 (1831), p. 9.

complicated the reliance of veterinary writers on the experience and practices of breeders. Youatt, while travelling at the expense of the Society to acquire knowledge of cattle breeds in England, wrote to the Society secretary Thomas Coates that the cattle breeders he met operated under 'self-bamboozlement' about the principles of breeding.[129] Karkeek was one of many writers on animal medicine and breeding active in the early decades of the 19th century that sought to establish themselves as commanding both practical knowledge of animal breeding and physiological (and finally biblical) knowledge of the origins and teleology of animal bodies.[130] But both Karkeek and Youatt recognised that there was by no means a top-down level of influence in the science of breeding: practical breeders held claim to an expertise that even intermediary figures like Karkeek could not claim to hold. A quick look at the *Rural Cyclopaedia*, published in Edinburgh in 1847 with a targeted audience of farmers, land stewards, and breeders, shows that within the world of breeding there were very important social differences, and that it was by no means clear that authority neatly followed class:

> Some wealthy and patriotic landlords expend much wealth, great patriotism, and not a little labour and science in improving local breeds of live-stock, in introducing superior breeds from other districts and countries, and in indoctrinating the agricultural community with enlightened principles in the art of breeding; but such men are benefactors of their country rather than breeders, and must be viewed, rather as patronizing the art of breeding, than as

129 "I have been brought into personal collision with many of the [...] breeders: I have listened to their own explanation of the principles of cattle breeding – I have had [...] of cross questioning them and have been called to form some estimate of their improvements. Their disappointments – their judicious pursuits of admirable objects. [...] chase after that which it was impossible to accomplish – their science and reasoning – their ridiculous measure and their disgraceful jealousy – I have been taught of which before I had scarcely an idea, what I was to believe, and what I was to reject as, I will not say, at least always, designed, but habitual – unconscious, and even self-bamboozlement deals there." (SDUK Coll. Youatt W. to Thomas Coates, 20 October 1832, 1).

130 See discussion of Karkeek and Youatt in: R. Preece, *Immortal Animal Souls (* London 2005). See also R. Preece, 'The Prodigious Mr Youatt: Some Unanswered Questions', *Veterinary History,* no.12, 3 (2004), pp. 261-272.

> taking part in any of its ordinary cares and toils. Professional farmers, who labour for profit, are the only true class of practical breeders.[131]

Because 'practical breeders' constituted most of the intended readership of agricultural periodicals and texts on breeding, a premium was placed on contributor's having experience with 'ordinary cares and toils.' When Youatt was writing his treatise on the horse, he found himself in disagreement with a member of the editing committee on the appropriateness of the term 'race horse'. The editor thought the term unscientific. He insisted that the use of the term was necessary because: "its important object will be more surely accomplished when it seems to come from one who knows and loves the horse than if it contained a mere dry detail of breeding, feeding and of anatomy – I must be indulged here."[132] Youatt's contention is that the work will not accomplish its goal if its author does not use the language associated with those that 'know and love' horses – practical breeders, farmers, and the like. He viewed his own authority as resting in no small part on his appearance as taking part in the practical concerns (and delights) of the horse breeder.

The discussion over authority in the agricultural literature of the time goes hand-in-hand with the way that writers at all levels conveyed observational evidence in the form of anecdotes. While historians like Robert Richards have downplayed the importance of anecdotes about animals, such stories – often attached to an eminent name or authority – were essential to the dialogue about heredity for most of the 19th century.[133] The preferred form of evidence in weighing

131 'Breeders', in J.M. Wilson (ed.), *The Rural Cyclopaedia*. Vol. 1. (London 1847), p. 521.

132 SDUK Coll/ W. Youatt to T. Coates, Friday (?) 1829.

133 See Richards (1987). Richards prioritises the importance of Conwy Lloyd Morgan's 'canon' in bringing a limit to the uses such stories were bought to in biological debate, but this belies the fact that these animal stories were often employed in some of the most heated and important

one theory of heredity against another, it was not uncommon to find the pages of such periodicals filled with anonymous stories about the danger presented by the inheritance of mutilations. A prime example of how such anecdotes traffic can be taken from Darwin's (1871) *Descent of Man*. Here, Darwin informed us, that "The well-known veterinary Blaine states that his own female pug became so attached to a spaniel, and a female setter to a cur, that in neither case would they pair with a dog of their own breed until several weeks had elapsed."[134] Darwin used the story to provide evidence for his theory that domesticated dogs choose sexual partners based on size. How did Darwin know that Blaine related such an anecdote? Because he found it in the pages of Alexander Walker's *On Intermarriage*, (1838), where Walker availed himself of the anecdote in order to provide evidence of environmental factors that must be counted into the effects of heredity. Originally, the story was provided in Delabere Pritchett Blaine's work *Canine Pathology*.[135] Blaine used the story to argue something different entirely to Darwin: in his (1817) work, the anecdote served to illustrate that mental associations in the mother at the time of conception can inform the habits of the pup. Darwin helped himself of the anecdote to stand in for any absence of observation of the mating habits of animals in the wild. Walker and Darwin both put the story to different uses than Blaine. Very often, stories like this were treated as pieces to larger puzzles, and their narrative details afforded them different ways of fitting into larger pictures of nature at different times.

Blaine, the partner of Youatt for many years, was a name that carried

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debates on the subjects of heredity (for instance, the Spencer-Weismann debate).

134 C. Darwin, *Descent of Man* (London 1871), p. 524.
135 D. B. Blaine *Canine Pathology (*London 1817), p. 46.

authority; but farming and agricultural periodicals were a means by which such stories could be gathered and compiled, indeed the gathering of such stories (or simply 'knowledge') was often an explicit goal expressed by the founders of a publication. Anonymous anecdotes were still the norm in such publications, often attesting to have observed the inheritance of mutilations or acquired peculiarities. *The American Turf Register* published the following anecdote:

> Accidental injuries sometimes become hereditary blemishes. Little Billy had one eye put out when a colt, by accident, the other remained good during the whole time he was on the turf; after he became a stallion, he lost his other eye by a stroke of the whip from his groom, in a few years after, many of his stock were blind, and this did not occur until he had been some years in that condition.[136]

Almost all farming and agricultural publications invited contributions from their readership, and these contributions often took up the task of either confirming or disproving prevailing views on heredity.

William Youatt and SDUK

I turn now to focus on how Youatt's own editorial contributions and his writings promoted the belief in the inheritance of acquired peculiarities. Carlos Lopez-Beltran has demonstrated in his (2004) that in France, the early decades of the 19th century saw a transformation in viewpoint on heredity – where previously it had been seen as a minor point in medicine, it grew to become "the main [...] cause responsible for all natural bodily (and thus, for some, moral) endowments of individuals."[137] Heredity was the enlightened principle that Youatt sought to convey

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136 'Dissertation on the Blood Horse, Breeding for the Turf, the Road, &C &C' *American Turf Register and Sporting Magazine* no.4:2 (October 1832). pp.65-75. p.74).

137 C. Lopez-Beltran, 'In the cradle of heredity; French physicians and l'heredite naturelle in the early 19th century', *Journal of the History of Biology*. no.37, 1 (2004). pp. 39-72, p. 40.

to his readers in as many forms as possible. A former Unitarian minister, Youatt used his position in the *Society* to steer it towards a view of nature that Youatt shared with many other Unitarian thinkers of the late 18th and early 19th century. Youatt's view was through-and-through established in the idea that virtually all peculiarities, physical and mental, are the product of heredity. Built into this view of heredity, as I explore below, was a theological account of the world that positioned mankind and animals as being capable of training and improvement, moving by generations towards a state of grace, or ideal organisation. He was also aware that this emphasis on heredity was a new approach for many in his audience. "Every quality," he wrote (when advising on sheep), "good and bad, is more decidedly hereditary than many have supposed, or are willing to allow."[138] In the pages of *The Veterinarian* as well as his treatises on domesticated animals, Youatt and his colleagues, William Karkeek and Delabere Blaine, continually returned to heredity as a source of the ailments, illnesses, and deterioration of stock in Britain. In his publications for SDUK, including his contributions to the *Penny Cyclopaedia*, Youatt continued to press his views forward, shaping the wider picture of nature that SDUK put forward across its multiple publications.

While Youatt, towards the end of his life, had partly fulfilled his desires to reach a position of eminence in animal physiology and zoology, at the beginning of his career he was as far removed from academic society as he was that of medicine. Having served briefly as a Unitarian Minister, Youatt apprenticed himself to Delabere Pritchett Blaine in 1812 or 1813.[139] It was through the *Society for the*

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[138] W. Youatt, *Cattle: Their Breeds, Management and Diseases* (London, 1834), p. 37.

[139] Outside of an opportunity to minister to one of Lord Byron's dogs, Youatt made no name for himself in medical, agricultural, or physiological publishing for the first decade of his practice. See R. Preece and J. Clelow, 'William Youatt and Byron's 'favourite' dog', *Veterinary History,*

Diffusion of Useful Knowledge, which he began to work with in 1829, that he gained access to the scientific works he needed to produce his own books. "Could I," he wrote to Coates, "have access to some good agricultural library what an immense advantage would it be to one, for there is not one of the circulating libraries in Town [London] which contains one twentieth of the works which I want on agriculture and natural history."[140] Youatt's treatises contain extensive physiology, and certainly he wanted from Coates greater access to the natural history of his time. But they also contain a tremendous store of practical advice on the maintenance and breeding of livestock. Youatt was no farmer; he could not become an authority on the topic of heredity and breeding without making recourse to the writings of practical breeders and farmers.[141] Through the Society and the relationship it brought him to the University of London, Youatt transformed himself from a veterinarian on Nassau Street into an eminent authority on animal physiology.

As a publisher, Youatt enjoyed great fame and authority, if not financial success. In the 1830s he undertook to write for SDUK a series of texts on domesticated animals: horses (1831), cattle (1834) and sheep (1837) being the most influential. Youatt underwent a prolonged bankruptcy case from 1831-1835, during which time he continued to edit and publish his journal *The Veterinarian* and

no.15, 1 (2009), pp. 1-15.

140 SDUK Coll/ W. Youatt to T. Coates (undated) 1828.

141 For "Cattle" Youatt was able to convince Coates to urge the Society to sponsor him on a trip through the Midlands and Ireland in order to observe the different breeds and to get a sense of different practices (see SDUK Coll/ W. Youatt to T. Coates, 26th September 1832, and 10th October 1832). Youatt primarily visited aristocratic farmers and landed gentry, but he also made prodigious use of *The Farmer's Magazine*, which included numerous submissions from practical farmers and breeders).

compose his treatises on domesticated animals.[142] His relationship with the secretary for SDUK, Thomas Coates, consists of over a decade's worth of panicked and apologetic letters; he struggled with an enormous workload of teaching, veterinary practice, and writing in order to maintain his family, and like many physicians of his day, enjoyed no financial security.[143] His teaching commitments at the University of London were always tenuous and he worried greatly that the Council failed to recognise him as an authority in zoology and animal physiology. He complained that he wanted to be "an appointed and not suffered lecturer."[144] While his writings were some of the most successful that the SDUK published (aside from maps), Youatt was never able to realise his ambitions of joining the committee; his influence remained that as a contributor.[145] In January of 1847, Youatt ended his life in a fit of 'temporary insanity' by consuming prussic acid from his medicine chest.[146] He had been greatly in debt due to speculations and accumulated debts (not uncommon for older physicians at the time).[147] In his final years, his daughter began writing on his behalf to Thomas Coates in completing the

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142 Youatt was declared bankrupt in several papers on February 16th, 1832. See for example 'Notices', *The London Gazette* (February 10th 1832), p. 26.

143 SDUK Coll/ W. Youatt to T. Coates. January ? 1831: "My Dear Sir, Please give an answer about the need for [the treatise on the Horse]– I am at present hour – destitute – the frignees have 250£ of my money advanced by me on property." Several letters later, Youatt writes to apologise for neglecting his responsibilities: "I grieve that I shall once more disappoint you – I have slept at home but two nights since I was in the south [...] and composition has been perfectly out of the question – I have been in fault too many a time – but I do [assure] you that neither wish nor endeavor have this time been wanted – I am now home, I trust for good, I will set to work. Believe me, my dear Sir." SDUK Coll/ W. Youatt to T. Coates, 21 January 1831).

144 SDUK Coll/ W. Youatt to T. Coates, 1st April 1831.

145 SDUK Coll/ W. Youatt to T. Coates. 1st April 1831.

146 'Suicide of Mr Youatt the Veterinary Surgeon', *The Morning Post,* no.22 (January 13th 1847), p. 811

147 See *The Court, Daily News*. (January 13th, 1847), p. 195.

manuscript for *The Dog*.[148] Ironically, Youatt's treatises and his reputation were continuing to grow during his years of decline: and the importance that his reputation would play in Darwin's arguments for the principle of natural selection would take place in the wake of his highly-publicized and well-known suicide.

Youatt's four treatises (including *The Dog*) remained in print for decades, and became canonical texts cited as authorities in agricultural periodicals and treatises in Britain and America. Covering a wide range of topics related to each animal, the treatises provided detailed advice on breeding. The inheritance of mutilations, injuries, and changes to the animals' constitution, as well as the inheritance of habits adopted by animals, feature largely in the works, shaping community knowledge about animal breeding for the decades to follow. In *The Horse* (1831), Youatt reminded his readers that the first axiom of breeding was 'like will produce like', and that “the progeny will inherit the qualities, or the mingled qualities, of the parents.”[149] Youatt, in keeping with the advice of sporting and turf magazines of his day, took this to include acquired characters as a matter of course. “Even the consequences of ill-usage or hard work,” he warned, “will descend to the progeny.”[150] Youatt included a warning that older parents would transmit a weakened and fatigued constitution – a common view at the time of both breeding animals and families.[151] In *Cattle; their Breeds, Management, and Diseases* (1834), the principle of 'like produces like' is produced once more, this time with the added comment that “This is the governing law in every portion of animated nature.”[152]

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148 See SDUK Coll/ W. Youatt to T. Coates, January 13th 1844.
149 W. Youatt, *The Horse,* (London, 1831), pp. 219-220.
150 Ibid., p. 220
151 Ibid., p. 221
152 W. Youatt, *Cattle; their Breeds, Management, and Diseases,* (London, 1834), p. 522.

Here, more so than his other books, Youatt argued that British farmers neglect the importance of the breeding points of the female, believing that the desired characteristics stem from the male. Youatt cited the sagacity of older breeders that rejected calves whose mothers were older, or sickly, or injured in any way.[153] The importance of such anecdotes and widely-held beliefs was important because Youatt, himself, was not a farmer or a breeder. Youatt, in researching *Cattle,* was intrigued by anecdotes of cows being affected by their own powers of imagination while in season. He included an anecdote from the *Quarterly Journal of Agriculture* that attested to a calf being born that resembled in colouring an ox that has frightened the mother.[154] Youatt had toured extensively to research the methods and ideas put forward in his book; it provided a reflection of breeding points and practices that Youatt had learned from the breeders and farmers that he visited. In *Sheep: Their Breeds, Management, and Diseases* (1838) the adage 'like produces like' was again produced as the first axiom of breeding: and quickly following it, Youatt warned defects and blemishes of any kind (even those acquired in the life of the sheep) could affect the blood.[155]

As I show in the sections below, Youatt's inclusion of such advice was not merely born out of his effort to provide an inventory of the preferred breeding methods of his day – he was not a breeder himself, but his pride and ambition would never have permitted such an approach. Youatt's returning interest to the idea that acquired characteristics were inherited by offspring across all animated nature had theological origins, informing his view of the divine trajectory of nature

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153 Ibid., p. 522-3.
154 Ibid., p. 523.
155 W. Youatt, *Sheep, The Breeds, Management, and Diseases* (London: 1838), p. 109.

and the promise of improvement.

Unitarianism, animal cruelty, and the inheritance of acquired characteristics

William Youatt, like many Unitarians at the start of the 19th century, found many professional doors closed to him. He received religious training at Northampton Academy from 1791 until 1798, training briefly alongside Lant Carpenter (the father of William Benjamin Carpenter). For reasons never made clear, Youatt chose to leave the ministry in middle life and retrained as a veterinary doctor in the practice of Delabere Pritchett Blaine. Part of the reasons at play might have been theological. A commenter on the history of the politics at play in Unitarian parishes noted that Youatt, during his tenure as a minister in Chichester, was associated with the 'liberal sentiments' of his predecessor John Predden, who had argued (in line with the later thought of Unitarian minister James Martineau) that "the single point he had in view, was to discover the truth, without any fear of the consequences; which he was fully convinced must always in the end prove right, as he firmly believed God himself made the rule of his own actions."[156] Unitarian parishes were not uniformly in favour of the belief that the exercise of reason inevitably led to divine truth. Lant Carpenter, as Adrian Desmond observes, was a 'controversial'[157] figure – he published against the presence of superstition in Christian practice, argued for the importance of scientific enquiry, and ran the school at which James Martineau would receive his training. In drawing parallels to John Predden, Carpenter argued that: "there never was a profounder veneration for

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[156] J.F. 'Succession of Dissenting Ministers at Chichester', *The Monthly Repository (*May 1843), pp. 329-330.

[157] Desmond (1989), p. 210.

the Gospel, than exists at present among the highest in the walks of science."[158] Lant Carpenter, opposed to the Tractarians, upheld that science could lead persons to religion, and that religion could lead people to science; no distinction ought be made between natural and divine law. It was a view that Youatt championed throughout his later career as veterinarian and lecturer.

By the 1820s, numerous Unitarians had adopted the position that an inborn capacity to adapt to different climates had produced the different varieties of the human race. Many advocates of the climate theory avoided the question of *how,* precisely, a new climate engendered new characteristics to be produced in a race or variety. For the Unitarian physician and medical writer James Prichard, the inheritance of acquired characteristics – an idea he rejected in his early writings – was, by the 1830s, the means by which new characteristics, for better or worse, were communicated. Prichard was content to discover in the inheritance of acquired characteristics an explanation of both the unity of mankind and also a principal cause of insanity, unifying the theoretical underpinnings of his work as a racial scientist and with the Lunacy Commission. Youatt, as I argue in this chapter, placed theological importance on the forming of *habits* in both mankind and in domesticated animals, in redeeming and improving the family line. The importance of this principle extended to how his treatises were organised. Youatt was careful to structure his treatises such that the consideration of various breeds demonstrated the principle of adaptation to climate, and the transmission of peculiarities – a point he stressed in correspondence with Thomas Coates:

> My opinion is certainly decided that the differentiation of the different breeds should precede the consideration of the general

[158] L. Carpenter, *Sermons on Practical Subjects, Selected by W.B. Carpenter (*London 1840), p. 5.

> structure otherwise many an illustration of [how] the beautiful adaptations by the frame to the peculiar are of service to the animal must be either omitted or become obscure or perhaps unintelligible.[159]

Youatt followed this structure in most of his treatises on domesticated animals, prioritising the same lesson about the origin of breeds time and again: namely, that a breed is a beautiful (as in evidence of Divine providence) adaptation by the frame to the peculiar, transmitted via heredity.

While espousing a literalist biblical creationism, Youatt should not be mistaken for drawing a sharp line between brute and man – in fact, Youatt's religious views allowed him to nearly efface any great difference between animal and human (he granted that humans were joined to immortal souls, but had little to say about these supernatural features). As Radick (2007) has argued, evolutionists in the 1860s, while emphasising the structural similarities between ape and man, where still at pains to distinguish the moral and rational faculties as separate from the animal realm.[160] Here, the converse focus is adopted: a religious defence of the shared moral fabric of the animal and human realms. God did not cherish or love humanity any more than he did the rest of creation, in Youatt's eyes: humanity's role in creation was privileged, but at the physical and mental levels this was a matter of some extra cortex and more sophisticated reasoning powers, and little more.[161] Physiologically, he stressed the importance of the homology

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159 SDUK Coll/ W. Youatt to T. Coates, 2 October 1829. p. 1.

160 G. Radick, *The Simian Tongue* (London, 2007), p. 32.

161 "Observation and experiment are fast leading to the conclusion, that it is one particular part of the brain that is the peculiar seat of intelligence--the *external, cineritious*, or *cortical* part. To this portion fibres may be traced from all the organs of sense; and from it to every part of the frame. Thither the intelligence is communicated, and thence the commands are received. That portion, comparing the bulk of the different brains, is far more abundant in the human being than in any of the inferior animals. We are establishing no rivalry; we presume not to hint – for it is wisely hidden from us – at any similarity or difference in the development of intellectual power; but that which we are enabled to trace is in perfect harmony with the situation and

between human and animal nervous systems. And he was also ready to point out to his readers that humans were by no means perfect superiors over the rest of creation. In his essay on animal cruelty of 1839, he writes:

> Whatever may be said of the presiding intellectual or spiritual power in the human being and the brute, the same nervous system is found in both, and, all cruel experiments being avoided, there is not, there cannot be, a more interesting subject than the gradual development of the nervous system through the various tribes of living beings. On account of the situations in which they are placed, and the services which they are designed to render man, the organs of sense are far more powerful in the inferior creatures than in the human being.[162]

Like the monists that would follow in his wake, for Youatt, physical identity must imply mental identity, hence he invested in animals a strong capacity for moral reasoning. "I pass to another division of our subject – the moral qualities of brutes. What, of brutes? Ay! and strongly developed, and beautifully displayed [...] "But," say some, "they are mere instincts!" We care not for that. These instincts or propensities are the foundation of every virtue in the human being."[163] This shared foundation of mental life, in animals and humans, formed the basis for Youatt's understanding of how domestication was possible. The breeder, in his view, was not taking the reins of nature so much as he was fulfilling his duty to care for Creation.[164]

Youatt's understanding of instinct was potentially coloured by the writings of the Quaker Physician Thomas Hancock a decade earlier. Like Hancock, Youatt

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duties, and, probably, the prospects of the two classes of beings." W. Youatt, *The Obligation and Extent of Humanity to Brutes* (London 1839), p. 42.

162 Ibid., p. 39.

163 Ibid., p. 65.

164 "The mutual relationship between man and the lower animals was often referred to in the laws of Moses, and next to the preservation of the pure worship of Jehovah, there was not a point so uniformly and systematically pursued as the promotion of humanity towards the inferior creatures." Ibid., p. 13.

assumed that instincts were produced by the inheritance of acquired characteristics. A habit, formed by an animal (or a person) would, over generations, become instinctive. Hancock, as Augstein argues, had been one of the first voices in Britain to argue that instincts, rather than belonging solely to the realm of the brutes, were part of the mental architecture of brutes and humans alike.[165] Hancock had also written on the modifiability of instinct in domesticated animals, though he thought that in certain instances, domestication could introduce moral decline within animals (the beaver was a more noble creature in the wild than it was when domesticated and trained). Youatt viewed the nervous system as developing across species in such a manner that comparison becomes problematic: many species inherit nervous systems whose powers of perception dwarf the human nervous system. "Each [animal] has a brain and nerves of various systems connected with the intellect of the animal, or with the general functions of life: and every one is admirably adapted to the situation in which he is placed, and the peculiar destiny he has to fulfil."[166] Animals were, according to Youatt, adapted to their situation – but they were also, more importantly adapted to their destiny – in other words, to domestication, or adapting to a new climate. Here, the inheritance of acquired characteristics came to play its important role in his view of nature's economy.

That the shared mental lives of humans and animals ought to warrant an extension of moral treatment is clear – but to our interests, what is most germane is how this shared mental life between humans and domesticated animals can, through the practice of domestication and breeding, grow closer in character. How is it that animal minds are plastic enough that the wild constitution can be

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165 H. Augstein, *Race, the Origins of an Idea, 1760-1850, (*New York 1996), p. 323.

166 Youatt (1839), pp. 37-8.

supplanted, or replaced or modified to become a domestic constitution? Youatt made some effort to answer this question in his history of cattle:

> It fares with the ox, as with all our other domesticated dependents, that when he has lost the wild freedom of the forest, and become the slave of man, without acquiring the privilege of being his friend, or receiving instruction from him, instinct languishes, without being replaced by the semblance of reason. [...] But when he receives a kind of culture at our hands, he seems to be enlightened with a ray of human reason.[167]

Culture, like climate, introduced new habits in humans and animals alike. Habits that, over generations, had produced domesticated animals, producing the characteristics that distinguished them from their wild ancestors. While Youatt did not expand on this idea in print, we know from Youatt's advertisements of his lectures at the University of London that Youatt gave equal weight to practical subjects of disease and the question of adaptation. Advertising to the "veterinary and the medical student" as well as the "general enquirer" Youatt promised to treat "many of the wise provisions of nature, and the beautiful adaptation of structure to the purpose for which the Horse, the Ox, the Sheep, and the Dog were designed."[168] Such speculative discussions as occur in the beginnings of Youatt's books were not merely there as ornamentation – they were, for Youatt, as integral to medical understanding as the practical advice on disease and treatment.

Animal cruelty and the inheritance of acquired characteristics

Essential to the success of the inheritance of acquired characteristics as a view of heredity – and also to Youatt's position that almost *all* peculiarities observed are hereditary in nature – was the view that the laws of generation operated the same

[167] W. Youatt, *Cattle: their breeds and management,* (London 1834), p. 4.
[168] SDUK Coll/ W. Youatt to Thomas Coates. 21 January, 1831.

in the human and animal case. This idea has been viewed as irreligious and potentially radical by historians of evolution and phrenology, but, as I argue here, the idea also had important ties to religious faith in Britain. Youatt undertook to publish pamphlets on animal cruelty, even after they had been rejected for publication by the Society for the Prevention of Cruelty.[169] One such pamphlet, "The Obligation and Extent of Humanity to Brutes," was particularly studied by Darwin for its near-exhaustive trove of anecdotes on the subject of animal intelligence, and in rhetorical form it bears striking resemblance to later works like Darwin's own *Descent of Man*, and George Romanes' *Mental Evolution in Animals*.[170] One of the main hurdles that Youatt faced was in convincing his peers that animals were not automata.[171] "Cattle are like most other animals," he wrote, "creatures of education and circumstances."[172] Recalling that Youatt conceived of differences between the mental capacities of different species as one of degree, and not kind, he formulated a description of what he termed animal reason.[173] It was this power that rendered some animals capable of domestication:

> In man there is still a superior principle [than instinct], and it is the same with the brutes that perish. It is not all instinct or propensity.

[169] W. Youatt, *The Obligation and Extent of Humanity to Brutes* (London 1839). pp. i-iii.

[170] Darwin C. R. 'Books to be read' and 'Books Read' notebook. (1838-1851) CUL-DAR119.- Transcribed by Kees Rookmaaker (Darwin Online, http://darwin-online.org.uk/)

[171] The causal cruelty towards animals common in Britain in the 18th century is excellently recorded and explored by Emma Griffin by comparing numerous private diary entries and journals. See E. Griffin, *England's Revelry: A History Of Popular Sports And Pastimes* (Oxford, 2005), pp. 120-121.

[172] W. Youatt, *Cattle: their breeds and management* (London, 1834). p. 4.

[173] "The brutes, then, are evidently possessed of attention, and memory, and association, and imagination. The difference between the biped and his quadruped slave is in degree, and not in kind. Then how stands the account as to the result of these preparatives for the exercise of the reasoning principle? By means of one of the senses an impression is made on the mind--attention fixes it there – memory frequently recurs to it – association and imagination combine it rightly or erroneously with many another--and judgment determines the value of it and the conclusions which may be drawn. This is the process of animal reasoning." Youatt (1839), pp. 48-9.

> They have the power of acquiring, and they do acquire knowledge from experience– they display a degree of memory, and of sagacity, and of docility, which are not estimated by us as they deserve, and which should procure for them an immunity from the cruelty of which they are frequently the victims.[174]

The power of acquiring extended both to the gaining of knowledge, and also the capacity to learn new habits. The power of acquiring was, for Youatt, the explanation of how heredity worked to alter varieties, breeds, and mankind. Whatever Youatt's personal motivations from his transition from Unitarian minister to veterinarian, his theological training resulted in him resembling an older generation of medical thinkers. Unlike those in his closest professional circle, such as the veterinary surgeon William Karkeek, Delabere Pritchett Blaine, and William Percival, Youatt regularly appealed to biblical authority: his work on hydrophobia (rabies), his writings on animal cruelty, his publications and papers on the constitutional ailments faced by wild animals in captivity at the Zoological Gardens – all took as their theme the divinely-ordained relationship between brutes and humanity. Youatt made use of the philosophical aspects of his lectures and writing for other purposes as well – he provided free tickets to the committee of SDUK to his lectures in the hopes that his treatment on such broad themes would further his reputation as a writer and contributor.[175]

There were textbooks being composed in Britain that espoused Youatt's general picture of heredity. The Unitarian physiologist William Benjamin

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174 Ibid., p.54.

175 SDUK Coll/ W. Youatt to T. Coates, 30th September, 1830. Youatt also requested that Coates let it be known to the Council at the University of London in the same year that he had been elected to the Zoological Society to help oversee experiments in animal physiology, as he thought this would increase the estimation the Council had of him – "to show the council that I am not quite unknown to, or overlooked by the best zoologists of our day." (SDUK Coll/ W. Youatt to T. Coates, 2 November 1830, p. 2).

Carpenter, whose own physiology textbook was first released in 1839, adopted a position remarkably close to that espoused by Youatt, suggesting that the instincts of domesticated animals were the result of their acquiring human-like tendencies through our shared lives.[176] The relationship of environment to the mental lives of animals was in Darwin's mind as well in the 1840s.

> It must I think be admitted that habits whether congenital or acquired by practice [sometimes] often become inherited; instincts, influence, equally with structure, the preservation of animals; therefore, selection must, with changing conditions tend to modify the inherited habits of animals. If this be admitted it will be found possible that many of the strangest instincts may be thus acquired.[177]

In the case of Youatt particularly, the belief that peculiarities acquired during the lifetime of an animal (or, by extension, a person) could be transmitted to offspring grew more out of his theological commitments than it did from his observations as a practitioner of animal medicine. Youatt was a product of his time: he incorporated growing medical evidence of homology between human and animal nervous systems into his theological position, and many of the agricultural reforms that he hoped for grew out of his religious position on cruelty towards animals.

Focusing on the issue of animal cruelty, Youatt's interest in anti-vivisection and the prevention of animal cruelty was not shared by his peers in the veterinary profession – but it was shared by his religious peers. As Paul Johnson has noted, "animal welfare reform movement was dominated by religious groups,

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176 "It is impossible not to recognise in many acquired habits, however, something more than a relation to the instincts necessary for the preservation of the species; they evidently arise, in part at least, from the connection of the race with man. This is more particularly exemplified in the instance of the breed of shepherds' dogs, which often display an extraordinary hereditary sagacity respecting their particular vocation." W.B. Carpenter. *Principles of Comparative Physiology*, 2nd ed., (London 1841), p. 511.

177 C. Darwin,''Explanation of Signs, &c. On Variation in Instincts and Other Mental Attributes', in F. Darwin (ed.), The foundations of The origin of species. Two essays written in 1842 and 1844. (Cambridge, 1909), p. 18.

overwhelmingly Nonconformist and Evangelical."[178] Emma Griffin has observed that while the 18th century saw fewer than twenty pamphlets published in Britain that dealt directly with the subject of animal cruelty, the turn of the century saw a new interest developing amongst dissenting and nonconformist communities and printed material.[179] Mark Blackwell attributes some of the success of the animal cruelty movement in the early 19th century to the simultaneous rise of the anti-slavery movement, agreeing with Laura Brown that the animal cruelty movement and the anti-slavery movement were both areas of discourse where the idea of what it means to be human was being revised.[180]

Heredity and The Veterinarian

I turn now to focus on how Youatt's own editorial contributions and his writings promoted the belief in the inheritance of acquired peculiarities. As I stated above, Carlos Lopez-Beltran has demonstrated in his (2004) that the early decades of the 19th century saw a transformation in viewpoint on heredity – where previously it had been seen as a minor point in medicine, it grew to become "the main [...] cause responsible for all natural bodily (and thus, for some, moral) endowments of individuals."[181] Heredity was the enlightened principle that Youatt sought to convey to his readers in as many forms as possible. Youatt's view was through-and-through established in the idea that virtually all peculiarities, physical and mental, are the

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178 P. Johnson, *The Birth of the Modern: World Society 1815-30 (*London, 1991), p.719. Quoted in R. Preece, 'Darwin, Christianity and Vivisection', *Journal of the History of Ideas,* (2003) pp. 401, 414.

179 "Those that regularly participated in discussions of treatment of animals had distinctive political-religious profiles. It was in periodicals which were nonconformist in religion and liberal in politics, such as Eclectic Review and London Magazine, that most of the articles about cruelty to animals were published. Other periodicals committed to animal protection include the Methodist Magazine, Wesleyan Methodist Magazine, and Primitive Methodist Magazine." E. Griffin, *England's Reverly: A history of Popular Sports and Pastimes* (Oxford, 2005), p. 118.

180 M. Blackwell, *The Secret Life of Things* (New York 2005), p. 94.

181 Lopez-Beltran (2004), p. 40.

product of heredity. He was also aware that this was a new approach for many in his audience. “Every quality,” he wrote (when advising on sheep), “good and bad, is more decidedly hereditary than many have supposed, or are willing to allow.”[182] In the pages of *The Veterinarian* as well as his treatises on domesticated animals, Youatt and his colleagues, William Karkeek and Delabere Blaine, continually returned to heredity as a source of the ailments, illnesses, and deterioration of stock in Britain.

Like many in his era, Youatt conceived of heredity as a mechanism that mingled the constitutions of sire and dam. However, he also recognised that blemishes and other qualities could skip a generation, in what was termed as breeding back.[183] He wrote, “Nature, however, although controlled, cannot be perfectly subdued. In some justly esteemed breeds of sheep we see traces of their original descent.”[184] (We will meet this problem again in our discussion of heredity and insanity). It was an observation of Youatt’s that would later interest Darwin, who expanded upon the concept of breeding back and who credited Youatt in paying attention to such features in his 1868 Domestication:

> We have plenty of cases of rudimentary organs in our domestic productions, --as the stump of a tail in tailless breeds,--the vestiges of an ear in earless breeds, – the reappearance of minute dangling horns in hornless breeds of cattle, more especially, according to Youatt, in young animals, – and the state of the whole flower in the cauliflower. We often see rudiments of various parts in monsters.[185]

A sire or dam passes on its constitution at the time of conception; but that

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182 Youatt (1834), p. 37.

183 “The progeny will inherit the qualities, or the mingled qualities, of the parents. [...] It should likewise be recollected, that although these blemishes may not appear in the immediate progeny, they frequently will in the next generation.” W. Youatt, *The Horse* (London 1831), pp. 219-20.

184 W. Youatt, *Sheep. (*London, 1837), p. 19.

185 Darwin (1860), p. 454.

constitution is still informed, in a way, but its long history of bearers, so that features from ancestors long ago are still visible and present (for the careful eye of the breeder). The transmission of peculiarities entered the theory at the question of what age one ought to breed two animals. A constitution is not fixed at birth; a healthy young mare would yield a colt with a strong constitution, whereas a weakened and elderly mare would yield a weak and frail colt.[186] Youatt, like nearly all agricultural writers, believed that the offspring of a young mare will differ in constitution from those that she bears late in life. Youatt's advice on horses would be often quoted and repeated in periodicals other than his own, and the suggestion that colts inherited the wear and tear of their parents' constitutions was a popular one.[187] Weaknesses in constitutions were also viewed as the determining cause of nearly all illness. The popular view at Youatt's time, particularly in regard to scrofula (a variety of tuberculosis) amongst humans, was that it was not illness per se that was transmitted from parent to offspring, but that an organism that has weakened its constitution through toil or bad living, will transmit a tendency towards that particular illness. Youatt advises, "There is scarcely a malady to which the horse is subject that is not hereditary."[188] This is where the breeder's practical experience, an eye for detail and knowledge of animals becomes a point of authority.

Youatt, with Karkeek, founded *The Veterinarian* in 1828. While the Royal

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186 "It is of no little importance, that the parents should be in full possession of their natural strength and powers. It is a common error, that because a mare has once been good, she is fit for breeding when she is no longer capable of ordinary work. Her blood and perfect frame may ensure a foal of some value, but he will inherit a portion of the worn-out constitution of her from whom he sprung." (W. Youatt (1831), p. 221).

187 'Improvement of the Breed of Sheep', *The Farmer and Gardener, and Live-Stock Breeder and Manager,* no.3, 36 (Jan 3 1837), p. 286.

188 Youatt (1831), p. 35.

Veterinary College had been established in 1791, *The Veterinarian* was the first publication of its kind to attempt to serialise veterinary knowledge.[189] This put Britain particularly behind France, whose leading Veterinary college published two journals every month.[190] The Royal College of Veterinary Surgeons would not register members until 1847, and the financial hopes of *The Veterinarian* hinged on achieving a reading audience not only of practicing veterinarians, but of farmers and breeders as well. Issues contained frequent requests from 'experienced breeders' to write in on questions concerning propagation. In 1837, *The Veterinarian* published a question from a farmer, 'Mr Young of Tarves' who had written in to request information from 'experienced breeders' as to whether or not hermaphrodite cattle could bear children.[191] Veterinarians, breeders, and farmers all contributed their observations of heredity at work in their livestock. Some of the information they communicated, as Youatt stressed, was time-sensitive: concerns about outbreaks of illnesses that could become hereditary were common, and Youatt relied upon breeders to report their experiences.[192]

The periodical quickly filled with observations sent in by breeders, veterinarians, and farmers. In August 1837, a farmer wrote in to complain that the necks of his lambs were enlarged. From the details provided, an anonymous correspondent 'Veterinarius' wrote in to suggest that the ailment was at root hereditary.[193] The full diagnosis is worth reading:

> As the South Down are a breed of sheep which prevail on the dry chalky downs in Sussex, as well as the hills of Surrey and Kent, I

[189] See 'Veterinary Periodical Publications', *The Veterinarian,* no.1, 1 (January 1828), p. 1.
[190] Ibid., p. 3.
[191] Mr. Young, 'Free Marten', *The Veterinarian,* no.10 (1837), p. 607.
[192] See *The Veterinarian*, no.10 (1837), p. 557.
[193] Veterinarius, 'On the enlargement of neck in lambs', *The Veterinarian,* no.10 (1837) p. 556.

> should impute this defect to the influence of the water in any new locality, and it's probably possessing some saline or mineral properties, which did not exist on their native hills. As regards the flocks of the other breeds, those ewes which did not produce lambs with this defect had probably become habituated to the properties of the water in their new residence.[194]

The veterinarian conceives of the illness as being a product of heredity, climate and habituation. The sheep of neighbouring farmers, having been exposed to the water, have habituated to it and now produce lambs that inherit this habituation. The newly-introduced animals lack this ancestry. Youatt was particularly enthusiastic that such exchanges occur in his periodical. "Every intelligent inquirer," he urged, "--every friend to veterinary science – will be welcome to our ranks; and to unfounded prejudice and empiricism alone shall we stand opposed."[195] Particularly gratifying were communications, like that submitted by the farmer on the South Downs above, that stressed the importance of breeding. The editors shared a belief (which they espoused in lectures and editorials of their own) that, in Percivall's words, "Ab origine, there could have been but one single breed or kind: climate and soil have, doubtlessly, had their influences in multiplying and varying the produce." [196]

William Karkeek, who contributed a large portion of the content of the early issues of *The Veterinian,* shared Youatt's emphasis on hereditary causes. Karkeek claimed in 1831 that a synthesis of knowledge from animal breeding and human medicine had demonstrated that infections were not constitutive of illness: all illness stemmed from 'particular conformation[s] of structure, transmitted from the

194 Ibid.
195 W. Youatt, 'Observations on the present number', *The Veterinarian* no.7 (1835), p. 615.
196 W. Percivall, 'Mr Percivall's Introductory Lecture', *The Veterinarian* no.7 (1835) p. 4.

parents to the offspring."[197] For the first three issues of the periodical, Karkeek contributed a serialised lecture on the principles of breeding. For Karkeek, the exclusion of those with imperfect constitutions, coupled with good pasture (or good civilization) would mark a virtual end to illness (however improbable that goal might be). Pace Alexander Walker (whom I consider below), Karkeek viewed breeding in-and-in as the means by which perfect constitutions were strengthened. For Karkeek, animal and human bodies were best conceived of as machines that operate in an environment wherein "Every thing around living bodies tends constantly to their destruction; and to this influence they would yield, were they not gifted with some permanent principle of reaction."[198] The constitution, allied in Karkeek's worldview with the sustaining action of the creator, was the principle by which the organism resists destruction and infection from its environment, and regenerates damage inflicted. The constitution was not merely physical, but neither was it immaterial: Karkeek left the metaphysics to be sorted out by another authority. Like the physician Thomas Bushnan (discussed in Chapter Two), Karkeek viewed animal and plant life as able to transmit the good effects that cultivation and breeding had, but he also viewed all life as ultimately tending back to a cursed state. When a breeder in Devon claimed that his cattle had 'existed the same from time immemorial', Karkeek countered that "despite of all their care in breeding from none but the blood-red kind as indicating the purity of the breed, still it carries in its blood some taint of the aboriginal race."[199] What was important for Karkeek was that constitutions inform heredity: they constitute a record of the

197 W. Karkeek, 'On Breeding', *The Veterinarian*. no.4 (1831), p. 1.
198 W. Karkeek, 'On the external causes of disease', *The Veterinarian,* no.6 (1833), p. 132.
199 William Karkeek, 'The Ancient History of the Ox', *The Veterinarian,* no.11 (1843), p. 186.

organism's habits, strengths, and failings.

The Veterinarian also served as a platform to other authorities. Blaine, Karkeek, Percivall and Youatt regularly reproduced their own lectures, or reprinted synopses of lectures by figures like Thomas Andrew Knight. But other prominent figures also chose to contribute their experiences and observations. In October 1843, shortly after the death of his wife, the physiologist Robert Knox contributed his views on the question of how many species of cattle existed in Britain.[200] This begins the period that Desmond has described as his "itinerant life of 'hack journalism'."[201] Soon to be fully side-lined from medical practice and teaching in Scotland, the article is part of the efforts Knox made in his later career to support himself through publication and public lectures. The remarks included a thorough refusal of the theological views that Karkeek and Youatt had developed together in the journal – Knox maintained that now-domesticated species had never been modified by climate or civilisation, demanding that evidence of the inheritance of acquired habits must be demonstrated: "Where [...] is a pure breed of the wild pig to be seen now domesticated, and, although kept perfectly distinct from the domestic breeds, have notwithstanding assumed the habits and colours of the domestic breed?"[202] Knox's interest in the races of cattle were part of the preparation of evidence for his work on the races of man.[203] Desmond has claimed that these writings by Knox were symptomatic of his bitterness and search for sensationalism. And certainly his arguments were pitched directly in contrast to

200 R. Knox, 'Remarks on the supposed identity of the wild or white forest breed of cattle', *The Veterinarian* no.16 (October 1843), pp. 541-548.
201 Desmond (1989), p. 388.
202 Ibid., p. 548.
203 His considerations of animals reappear in his book on race, published several years later. See A. Knox, *The Races of Men: a fragment* (London 1850).

the editorial sympathies of *The Veterinarian*, which espoused that the taming and cultivating of wild animals into domestic animals was part of God's design. The fact that Knox addressed himself to the readers in a letter addressed to its editors speaks to the value that authorities placed in the readership of *The Veterinarian.*

How animal heredity dictated the human case: Alexander Walker's *Intermarriage*

Then, as now, the comparison of the animal realm with the human was one that brought with it religious, moral, and social difficulties. Yet perhaps the most important aspect to the emerging debates over the inheritance of acquired peculiarities was the wide-ranging search for evidence from plant, animal, and human cases. Was this blurring of the lines between human, animal, and plant life new and radical, or was it a well-established fact in the early 19th century that humans did not reproduce according to a separate set of laws from the rest of living things? As I demonstrate throughout this thesis, there are numerous contributions from gardeners, animal breeders, and amateurs from the 1830s onward that demonstrate an acceptance of and belief in the idea that the laws of inheritance that govern livestock and cultivated plants also shed light on hereditary madness and illness in families. Alexander Walker's 1837 publication of *Intermarriage,* a book applying the principles of animal breeding to marriage, was a calculated text intended primarily to produce financial rewards for its author, a struggling physician with grand ambitions.

The debate between preformationist and epigenetic views of the embryo in the 18th century had already introduced a new generation to comparisons of animal and human embryos.[204] Clerical figures like Thomas Malthus discussed human populations as being subject to the same natural constraints as those faced by animals, meaning that economic (and religious) debates that responded to Malthus would continue to debate the problems of human society with an eye to the functioning of laws that took all life on earth within its sphere. Medical appreciation that diseases ran in human families as well as in breeds of domesticated animals had long been perceived and known. Within the growing medical literature on madness, comparison of the inmates of asylums to animals were widespread, particularly from those asylum doctors with phrenological sympathies. The famous case of Victor of Aveyron, the mute boy discovered living in the forest in 1800, was reported in cheap newspapers and expensive scientific periodicals alike. Victor seemed to prove that, when isolated from society during childhood, children develop into beings more akin to animals than persons.[205] Still, it was Alexander Walker's 1837 publication of *Intermarriage* – the second in a trilogy of volumes designed to stir debate and bring him financial reward (if not scientific prestige) – that introduced into Britain the first sustained encroachment of the authority of the animal breeder in the domain of human marriage, an intrusion that was taken seriously enough to be criticised by many leading physiologists of the day.

Contemporary to Walker's publication were many isolated queries and questions about whether the laws of breeding applied to people as they did to livestock. As we saw above, Charles Knight's efforts to survey the reading habits of farmers and agricultural workers produced a picture of a reading public whose

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204 Muller-Wille & Rheinberger (2012), p. 64.
205 G. Shattuck, *The Forbidden Experiment: The Story of the Wild Boy of Aveyron*, (London, 1980).

common reading materials were limited to the bible and 'useful' or practical literature, and these genres of religious and practical writing tended to inform contributions to agricultural magazines. *The Farmer's Magazine*, a prominent agricultural periodical that tended more towards publications from practical farmers than authorities, gave voice occasionally to those that regarded ‘breeding in-and-in’ to be forbidden for both human and animal populations. In 1840, ‘a Cumberland Sheep Farmer’ complained that in-and-in breeding was not only a new theory, but one that went against biblical concerns as well as traditional practice: “‘In and in’ breeding in the human species is looked upon with abhorrence, and this will very naturally strengthen the objection to it in inferior animals.”[206] In 1836, an article in the same publication condemning the practice of breeding in-and-in with sheep appealed to the unusually high prevalence of insanity in Quaker communities in order to prove its point.[207] “If,” the author reasoned, “as all animals are constructed on one grand plan, we admit the proximity of the sheep to the human race, it follows, that what is destructive in this respect to the one, is destructive to the other.”[208] *Crossing*, as opposed to breeding in-and-in, was often burdened with political overtones by authors: it was biblically sanctioned, it ensured and trusted to the unity of mankind, and it was anti-aristocratic. But the only way that breeders were able to expand the repercussions of their observations

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206 'Sheep Breeding', *Farmer’s Magazine,* no.13 (1840), pp. 271-2.

207 'The Sheep (iii)', *The Farmer’s Magazine,* no.5 (1836), p. 105. It is interesting to note that the question of insanity amongst Quakers in America was one that Combe also raised. In his *Notes on the United States* (1842), Combe attributed the insanity in the sect to a combination of in breeding and excitation from the unique religious views. Combe’s position was contested within the pages of the *Phrenological Journal*, where a reviewer contested that the insanity was no doubt due entirely to inbreeding as the actual content of the religioous teaching was very sedate and gentle. ('Review: The British Medical and Foreign Review', *The Phrenological Journal,* no.16. (1843), p. 272).

208 'The Sheep (iii)', *The Farmer’ s Magazine,* no.5 (1836), p. 106.

was by insisting upon the natural equality of animals and humans, at least so far as the laws of heredity were concerned. Far from being the reserve of radical materialists, the argument that animals and humans shared mental lives, instincts, and were both subject to the same laws of heredity, were thoughts shared by figures like William Youatt and religiously-motivated breeders that contributed anonymous articles to magazines and periodicals.

It was through Walker's *Intermarriage* that many of the anecdotes and cases related to the inheritance of acquired characteristics in animals were put forward as having immediate consequence for making marriages in human society. On the 25th of May 1837, physician and writer Alexander Walker attended Thomas Andrew Knight's presentation of his paper on the "Hereditary Instinctive Propensities of Animals" at the Royal Society.[209] The paper was one of the last that Knight would deliver, and Walker was very proud to have received correspondence from Knight continuing some of the themes that Knight developed herein. The paper proceeded to deliver seven or eight anecdotes on breeding domesticated animals to strengthen domestic instincts, operating upon the hypothesis that "instinctive hereditary propensities might be stronger in [well instructed parents] than in the offspring of very young and inexperienced parents."[210] Knight argued that habits acquired in the lifetime of the organism are not only transmittable to offspring, but that the older the parent, the longer the habit has been practised, and thus the stronger the instinct will be in its offspring. While Knight was disparaging of crossbreeding, Walker borrowed heavily from Knight's thoughts on the transmission of acquired

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209 T.A. Knight, 'On the Hereditary Instinctive Propensities of Animals', *Philosophical Transactions of the Royal Society London,* no.127 (1837), pp. 365-369. See also A. Walker, *Intermarriage* (London, 1837), pp. 174-177.

210 Ibid., p. 366.

habits in developing his picture of heredity. What he produced in *Intermarriage* was a compilation of many anecdotes and cases, harnessed from agricultural letters, in defence of the inheritance of acquired characteristics. Walker repeated the cases described by Knight; he included others gleaned from encyclopaedias and treatises and also correspondence.

Walker, like Darwin, drew fine lines in distinguishing sources of authority. He cited liberally from correspondence with poultry breeders on the effects of inbreeding. But these anonymous sources did not have the final say – it was the correspondence from veterinarians that tempered and qualified this evidence.[211] In an attempt to draw on several different levels of authority on the subject of breeding chickens, Walker sent a questionnaire on the effects of breeding in-and-in to a number of practical chicken breeders. He then submitted their answers to the inspection of "Mr Nash of Windmill Road", an eminent authority on breeding. Nash's comments on the breeders' observations endorsed some of their observations, but also pointed out confusion and error in their opinions. Nash's view – that breeding in-and-in reduces size and fertility in the males – held the day.

Walker was poor. A common story traded about Walker during and after his life was that he was a genius at anatomy, and was expelled from medical school after correcting John Abernathy in the dissection theatre while a student at St Bartholomew's.[212] Walker failed to penetrate any school or medical institution in London as a lecturer, and turned to publishing for an income. His topics – beauty, marriage, women, and physiognomy – were carefully chosen for their commercial

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211 Walker (1837), p. 228-232.

212 L. Hartley, 'Walker, Alexander (1779-1852)', *Oxford Dictionary of National Biography*, (Oxford, 2004). stable URL: http://www.oxforddnb.com/index/101056049/Alexander-Walker. Accessed July 1st, 2017.

value. However, it would be unfair to deduce from Walker's position that his efforts at synthesising current opinion on breeding held no weight in the scientific community. References to Walker as an authoritative source on questions of breeding are scattered throughout Darwin's corpus, as well as the periodicals of the day. And one of Walker's chief concerns was the inheritance of mental illness stemming from either a weakened constitution on the part of the mother or father. Thus, *Intermarriage* is in many ways a synthesis of the medical views on madness in families, and current breeding practices with livestock. Like William Youatt, Alexander Walker's work became a source of authoritative anecdotes for Darwin, although Darwin clearly held Walker to be less worthy of authority or direct mention.[213]

Walker was singled out in Robert Todd Bentley's *Cyclopaedia of Anatomy and Physiology* in the article on Generation in 1839. "We shall not pursue the attempt [...] which some have made to apply the principles of cattle-breeding to the human species [...] however desirable and necessary an improvement of the breed may appear to some Utopian philanthropists."[214] Bentley clearly intended for his readers to have a clear understanding that authoritative science can have no truck with utopian speculations. Given Bentley's dismissal of the inheritance of mutilations and peculiarities in the same entry, his attitude towards Walker certainly made sense. The American physician Martyn Paine dismissed his work in

213 While Darwin refers to Youatt as 'sagacious' and an 'eminent veterinarian,' there are only indirect references to Walker throughout Darwin's corpus, and most often these are to merely cite the source for an anecdote or quote that Walker utilises. While Walker's work on intermarriage is a famous component of Darwin's library – it was read shortly before his marriage – the text is judiciously padded with extensive passages quoted from other authorities.

214 T. Allen,, 'Generation', in R.B. Todd (ed.), *The Cyclopaedia of Anatomy and Physiology*, Vol 2. (London, 1839), p. 473.

a footnote of his physiology textbook for students, commenting that "it abounds with errors and fanciful opinions." Paine's concern was that *Intermarriage*, while a popular treatise, would be studied by students of physiology.[215] The work was not received well in the agricultural publications of America. The Virginia publication *The Farmer's Magazine* praised Walker's book for gathering and compiling "a much more nice rule, or rules, for breeding offspring, than has hitherto existed." However, the reviewer is quick to point out that Walker's discussions are of use for animals only, and not humans – "profitableness, from the last act alluded to, may be too remote to excite attention."[216] In the pages of the northern publication *The Cultivator*, a practical and educational publication aimed at farmers, that sought to enrich both the mind and the soil, reception of the application of breeding practices to society was low. Humanity, its satirists warned, was soon to be governed by herd books of its own:

> A thorough bred man! An improved woman! (is there not a savor of blasphemy in this last implied possibility?) are expressions to which the public ear has not yet become accustomed; yet from present indications they will ere long become familiar as household words. The human races will be classified in "Herd Books," volumes will be written to develop the principles of physical perfectibility in men and women; and itinerant lecturers will find in it a source of gain, equalled only by the high mysteries of Phrenology and Animal Magnetism. Unlike these sciences, however, the branch of natural science under discussion has something in it directly tangible and as the means of improvement of which it is proposed that men shall avail themselves, are shared in common with the domesticated races of animals, the influence of the projected system has been, or may be, readily submitted to the test of actual experiment.[217]

The application of debates on the laws of heredity that had been derived from

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[215] M. Paine, *Medical and Physiological Commentaries,* 1 (New York1840), p. 466.
[216] 'Rules for breeding', *Farmer's Magazine,* no.8 (1840), p. 666.
[217] 'Walker on Intermarriage', *The Cultivator,* 7, no.11 (November 1840), p. 169.

agricultural science to human populations may have afforded opportunities for satire, but the question whether breeding in-and-in or whether crossing was a better breeding principle was a debate that was perfectly familiar to anyone that had an interest in horses or in livestock. Walker's criticisms of the aristocracy as having suffered from inbreeding, and his suggestion that careful crossing with native populations in the colonies would yield improved individuals may have been radical, but the extension of the fruits of agricultural science to human society was well-established by 1838 – physiologists, physicians, temperance advocates, and alienists all relied upon the public perception that there was something 'directly tangible' about the science of breeding – unlike phrenology, or animal magnetism, agricultural science provided a concrete and trustworthy source of anecdotal and statistical evidence for the transmission of acquired characteristics with which the wider public were already familiar. The technical language of breeding, unlike phrenology or animal magnetism, was a shared language between figures like Walker and the reading public.

Youatt's reception and influence

Darwin read both Walker and Youatt, but Youatt received a far more careful reading. While often neglected as one of Darwin's key sources by historians, Youatt held a long and important influence over the thought of Darwin, stemming from their first meeting in 1838. Charles Darwin and William Youatt met briefly On September 2nd of that year, when Darwin visited the Zoological Gardens. Darwin, recently returned from his voyages on the Beagle, was positioning himself as one of England's most important geologists. William Youatt was in physical decline but his reputation as a writer was increasing. Youatt had been appointed to the Zoo in

May 1833, and he received a decent salary of £100 that motivated him to do his best to retain the position despite his failing health.[218] He was suffering from an array of health problems and claimed that his 'daily crawl' to the Gardens was all that he could accomplish.[219] During this time rudimentary concerns at the zoo were still being worked out. Even five years after its founding, feeding the animals, providing heating, and recording the diseases that afflicted them were still problems for the council of the zoological gardens.[220] And while Youatt was a champion of animal rights, the zoo was beginning to attract already calls of cruelty and mistreatment.[221] Still, his association with the zoological gardens, founded only in 1828, made him one of a handful of figures interested in the question of climate and its influence on heredity that could observe first-hand the effects of captivity and transport upon the animals in the collection at London.[222] In almost all cases, the rule for plants and animals in being removed from their own climate was death. But that did not make the few cases of success less interesting. He was using his connection as veterinarian at the Zoological Gardens to study how phthisis and other constitutional afflictions came with removing wild animals from their climates.[223] The basis for his assumptions had come from years of practice with domestic animals, but it was one that furthered his reputation abroad.

Despite the fact that admission to the zoo required either membership to the Zoological Society or a sponsoring letter from a member, exhibits like the

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[218] T. Ito, *The London Zoo and the Victorians (1828-1859)* (London 2014), p. 40.
[219] SDUK Coll/ W. Youatt to T. Coates, 3 January 1838.
[220] Ito (2014), p. 40.
[221] Ibid., pp. 41-42.
[222] J. Bastin, 'The first prospectus of the Zoological Society of London: new light on the Society's origins', *Archives of Natural History,* no.5, 5 (Edinburgh 1970), pp. 369–388.
[223] 'Academy of Sciences, Paris', *The Morning Chronicle* (August 2nd, 1842), pp. 19.

introduction of giraffes in 1836 were widely reported by the scientific press, including Charles Knight's *Penny Magazine*.[224] The meeting between Darwin and Youatt came at a point when the institution found itself slowly moving from a restricted institution to one that would open its doors to the entire public. In order to wield authority on topics like animal physiology, he needed to appeal to the authority of men with practical experience. Youatt – for years after his death – remained one key figure upon whom Darwin continued to heap significance and praise.

Youatt often featured on Darwin's reading lists, and both his thoughts on animal psychology and heredity would inform Darwin's later work.[225] But he made his way into Darwin's notes on the day of Darwin's visit due to Youatt's firm belief that monkeys could distinguish women from men by sight alone.

> Mr Youatt (great veterinary surgeon) says he has not the slightest doubt that many monkeys, especially the Rhesus, & the great dog faced baboon know women perfectly – show unequivocally. – Waterhouse and every keeper state the fact to be certain. How wonderful. early men have seen women naked, must then smell & afterwards association by sight – this is most curious, is proof of origin of [markened].[226]

The comment made by Youatt clearly delighted Darwin, whose mind went immediately to the possibility that such intelligence was the product of what we could term the evolutionary past of the species.[227] It was not the first time that Darwin misread or misinterpreted him. Youatt would remain for decades a 'great

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224 Ito (2014), p. 97.

225 See also A.J. Lustig, 'Darwin's Difficulties', in M. Ruse & R. Richards (eds)., *Cambridge Companion to Origin of Species* (Cambridge 2008), pp. 122.

226 C. Darwin '[Orang utans at] Zoological Gardens,' 2nd September 1838. in J. van Whye, *The Complete Work of Charles Darwin Online* (http://darwin-online.org.uk/), 2011. Accessed July 21st 2017.

227 Ibid., p. 1

veterinary surgeon' but also 'a very good judge of an animal', a phrase that Darwin chose no doubt to communicate to an agricultural readership that Youatt's authority did not rest solely on his academic training or medical practice.

Darwin was keen to promote the successes enjoyed by practical breeders. When Charles Lyell and Joseph Hooker were charged by Darwin with presenting his ideas in the famous 1858 'joint paper' on natural selection, this celebration of the successes enjoyed by breeders gained some unexpected prominence. “It is wonderful what the principle of selection by man, that is the picking out of individuals with any desired quality, and breeding from them, and again picking out, can do,” the quotation from Darwin's 1844 thoughts read. “Even breeders have been astounded at their own results. They can act on differences inappreciable to an uneducated eye.”[228] In the years that followed Darwin continued to espouse the optimism he had for the art of breeding. Appealing to authorities like Youatt remained key.

Evelleen Richards has recently drawn attention to the importance of the influence of John Sebright's writings on animal breeding to Darwin's thought.[229] In both the *Origin* and *Domestication* Darwin makes frequent reference to Youatt as an authority. Indeed, Youatt is one of the first names that Darwin invokes in the opening pages of Origin on the powers that selection have over nature:

> Youatt, who was probably better acquainted with the works of agriculturists than almost any other individual, and who was himself a very good judge of an animal, speaks of the principle of selection as “that which enables the agriculturist, not only to modify the character of his flock, but to change it altogether. It is the magician’s wand, by means of which he may summon into life whatever form

[228] C. Darwin, & A. Wallace, 'On the tendency of species to form varieties', *Journal of the Proceedings of the Linnean Society of London,* no.3 (August 1858), pp.45-150, p. 51.
[229] Richards (2016), pp. 166-7.

and mold he pleases.[230]

One of the key points of Darwin's synthesis of use-inheritance and natural selection comes into development, many decades before the publication of *Origin*. For Youatt, climate and way of life inform the constitution; but selection is more powerful than environment, and allows the breeder to effect rapid changes where environment might be working gradually in the opposite direction. Darwin notes, "A slight difference in climate or pasture sometimes slightly affects the fleece, as has been observed even in different districts in England, at as is well shown by the great softness of the wool brought from Southern Australia. But it should be observed, as Youatt repeatedly insists, that the tendency to change may generally be counteracted by careful selection."[231] Youatt is not often recognised in historiography for playing such a continuous role in providing Darwin with observational and authoritative evidence; but his name is present at many of the key argumentative points in his work.

The quotations selected by Darwin does poor service to Youatt's own position: selection was not so much a magic wand but a divine responsibility bestowed by the Creator upon the farmer, and many of Youatt's most interesting and nuanced contributions are on the limits of the powers of breeding. Across all of Youatt's writing, there is a careful balance between two principles. The first is that all of Creation is designed by God to fit a purpose: the proliferation of its own form in the environment, by its own specialised means.[232] The second principle that emerges in Youatt's writing is his belief that heredity is the underlying cause of all

230 Darwin (1860), p. 32.
231 C. Darwin, *Animals and Plants Under Domestication* (New York 1868). p. 125.
232 See W. Youatt, *The Obligation and Extent of Humanity to Brutes (*London, 1839).

illnesses, and also the principle to which the appearance of all peculiarities must be attributed. Like many medical writers of his time, Youatt believed that changes in climate and domestication introduce new peculiarities into the constitution of animals and persons alike, and that these peculiarities are transmitted to offspring. As Roger Wood observes on the breeding of sheep, "local differences between races led to the conviction that blood was linked with locality – that is, that an animal's own nature and 'external' nature were somehow interconnected."[233] But Youatt understood the importance of this connection between blood and locality in biblical terms – and this made his writing more accessible to the readership that the Society for the Diffusion of Useful Knowledge was attempting to cultivate.

Conclusion

This chapter has shown that William Youatt, largely ignored by other historians of heredity, held an understanding of the inheritance of acquired peculiarities that was interwoven with his religious views. Through his treatises which enjoyed consumption by the wider population as well as figures like Darwin, and through his agricultural periodical *The Veterinarian,* Youatt worked to gather and compile cases and accounts that supported his understanding of animal breeding and heredity. This activity helped to establish an agricultural knowledge community that was not only able to respect Youatt's efforts to prioritise the authority of the practitioner, but also able to supply anecdotes and cases to him and his magazine which supported his larger views. Through this activity, the *Society for the Diffusion of Useful Knowledge* became institutionally important to the popularisation of these ways of viewing breeding livestock, and also the natural laws that governed

233 Wood (2008), p. 230.

inheritance.

Youatt failed to gain an eminent position within *The Society for the Diffusion of Useful Knowledge,* but he didn't need to have such power within the organisation to shape and dictate the narrative of heredity that its most important agricultural treatises conveyed. Youatt wrote on animal breeding in his treatises, and also within the pages of *The Veterinarian;* being neither a farmer nor a breeder, Youatt's views were necessarily composed of anecdotes and cases that he learned through conducting research and visits to farms, as funded by the *Society.* But Youatt's willingness to legitimise the advice that characteristics acquired in the life of an animal could be transmitted to offspring had deep roots in his worldview, particularly in his religious views. For Youatt, the very idea of 'like produces like' contained the promise that even characteristics and peculiarities acquired in the lifetime of an animal were potentially heritable. As I will show in the next chapter, Joseph Lindley provided similar support within SDUK for a view of heredity that included the inheritance of acquired characteristics. But already we can draw some important conclusions from the Society's readership, and its stated goals, and the means by which Youatt constructed his laws of breeding.

Firstly, Youatt himself had only the reputation of a veterinarian to build upon. As I showed, the emerging community of agricultural knowledge fuelled and fostered by periodicals and magazines valued *practical* experience above all else: even the authority of figures like Joseph Banks and Thomas Bakewell could be attacked as aristocratic dabblers that lacked the honed skills of the animal breeder. The desire was for a science of breeding that emerged from this prior art of identifying breeding points, a science that continued the established methods and means of inspecting animals that was already established. Youatt, in order to produce his treatises, became a student of these practices – not a passive one by any means, he brought with him opinions particularly concerning the fair and moral treatment of animals. But anecdotes from breeders and farmers constitute the grounds for his breeding instructions.

But Youatt's treatises are also clearly part of an effort to inform and communicate knowledge, despite being such a close and careful reflection of what was already common knowledge. Here, Youatt's treatises – and the wider aims of the *Society* – became an instrument of control. Youatt's lesson to his readers – and it was a lesson repeated by the medical and the botanical contributors to the content published by *SDUK* – was that not only were all peculiarities and characteristics hereditary, but that the relationship between humanity and nature was intended to be one wherein humanity recognised this principle and employed it to mitigate against the bad, and encourage the good. A community of farmers and breeders that could come into agreement in how to avoid propagating unwanted peculiarities, traits, and faults was the desired outcome.

Muller-Wille and Rheinberger note that this era is when key expressions such as 'like produces like' "become common parlance among breeders."[234] The idea of a common parlance however, presupposes the idea that there are communities, or sites wherein such commonality can take root. The production of a print culture that could make possible a common parlance was facilitated by SDUK and other such idealistic ventures. In *The Veterinarian* and also in researching his treatises on livestock, Youatt drew upon practitioners' knowledge, and more importantly he

234 Muller-Wille & Rheinberger (2012), p. 73.

prioritized their authority in marketing his books. But the production of these spaces – by which I refer to Youatt's treatises, *The Veterinarian*, and the gardening treatises and magazines I will explore in the next chapter – reasserted an understanding of heredity that brought the weight of the past to bear on the shape of present (and future) life. Youatt saw, written into familiar domestic breeds, the continuation of traits and peculiarities belonging to their ancestral past. The selection of animals for breeding could either propagate the misuse and injuries they experienced in life, or strengthen and improve the lines of the unblemished. Contemporaneous with this view of the animal world came extensions of these ideas to the human realm. In this chapter I briefly touched upon the example of Alexander Walker's *Intermarriage*, a text familiar to historians of science, although the representation of hierarchies of agricultural authority in the work have previously been neglected. The success of *Intermarriage,* I argued, was not the product of radical or inflammatory ideas: it was rather that it harnessed a common parlance, a way of seeing heredity, and encouraged the extension of that parlance to a wider domain. Within *Intermarriage*, familiar ideas about breeding points, the significance of anecdotal evidence, and of unusual and interesting cases, found sustained application to mankind. It had anti-aristocratic and potentially irreligious messages, but more importantly *Intermarriage* extended the authority of the practical breeder and agricultural sciences, much in the way that Youatt dreamed of expanding his own position from veterinarian to that of physiologist – an authority on all animate nature, and not merely livestock.

Finally, there is a tension between two different understandings of the role of religion: the first role being akin to personal faith, the second role having little to do with a person's personal faith, and more to do instead with determining how a person experiences and views their world. “The old faith is unbelievable,” Taylor writes, “but much of what it offered is essential.”[235] In other words, a given historical figure like Youatt or Walker might lack personal faith or even interest in religion, and yet still experience their world from a Christian (or Anglican) point of view. That remained essential: taking a view of nature that maintained the abstract possibility of a state of grace, from which brutes, plants, and mankind moved either towards or away from, according to their habits and manner of life. Understanding whether an authority like Darwin, or Carpenter, or Youatt, was a person of faith can help us to answer other questions about their worldview. But what I hope to have shown here is that we must also be attentive to the role of religion in the second sense, as a way of seeing and experiencing the world. Many of Youatt's readers may have dispensed with his religious conviction; but the ideas of heredity that he put forward, even when repeated by persons that did not share his faith, do not cease to provide a means of experiencing the world that is religious in origin.

235 Taylor (2007), p. 380.

Chapter Two: Plant heredity and the inheritance of acquired characteristics: grafting, budding, and fortuitous accidents

Introduction

The inheritance of acquired characteristics lent stability and regularity to the operations of nature. Once animal breeders and naturalists began to look for evidence of such inheritance, the continuity of peculiarities between parent and offspring became both visible and meaningful. In the realms of botany and gardening during this period, the means of taming plants, and making them more congenial to human flourishing, was one of the promises of the modern era. The garden, meanwhile, served as the site of the most readily-available means of scientific practice to most men and women in Britain. Muller-Wille and Rheinberger attribute the distinction between 'constant' characters and 'peculiarities' of plants that botanists began to introduce to efforts by gardeners across Europe to acclimatise exotic and foreign plants to new climates.[236] The significance of the garden as a site of experimentation and investigation into the nature of life has no parallel in our own time; but in the 1820s, when John Loudon founded *The Gardener's Magazine*, his belief that the publication would pioneer understanding of how to take the reins of variation and improvement in plant life was wholly justified. No historian neglects the significance of Darwin's own garden and cultivation of plants to the development of his thoughts; but Darwin was merely one of thousands of gardeners in Britain that held the ambition to make

[236] Muller-Wille & Rheinberger (2012), p. 14.

some contribution to understanding and controlling the generation of plants. An article on Darwin's attention to periodical and encyclopaedias by Susan Sheets-Pyenson alleged in 1984 that: “Darwin consulted works that his fellow naturalists might have scorned – the *Penny Cyclopaedia* and books on songbirds by the compiler William Kidd, for instance.”[237] We can debate what it takes to be counted as one of Darwin's 'fellow naturalists' but *The Gardener's Magazine* and *The Gardener's Chronicle* both featured contributions from members of the Royal Horticultural Society and the Linnaean Society. *The Penny Cyclopaedia* included contributions from G.H. Lewes, the physician James Paget and from John Lindley, one of the most important orchidologists of the 19th century. Thomas Andrew Knight, one of the most influential naturalists in Britain of the 19th century, put forward his most important (and controversial) views in a treatise on the cultivation of fruit trees that could easily be mistaken as aimed narrowly at practical gardeners.

My aim in this chapter is to look at how the inheritance of acquired characteristics was diffused through gardening literature. However, botany and gardening had a different language that corresponded to the two means of propagation available to gardeners: seed selection, and grafting. 'The inheritance of acquired characteristics' is a term that is missing from most gardening and botanical publications from this period. However, as I show below, the absence of the terminology does not mean that the same questions were being raised in gardening and botany as were being raised in agriculture and medicine. Both means of propagation provided evidence for the inheritance of acquired

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237 S. Sheets-Pyenson, 'Popular Science Periodicals of Paris and London: the emergence of a low scientific culture', *Annals of Science,* 42 (1985), pp. 549-572, p. 232.

characteristics in different ways. In the case of seed selection, botanists and gardeners sought to encourage desired habits and traits in cultivated plants with an idea that the seed, while reproducing the species and not the individual, would yet, over time, fix the habits of the parent. Grafting, meanwhile, was inherently a puzzle to authorities that wrote on plant heredity, but a number of important and unusual cases of grafts became fuel for later debates over Darwin's pangenesis, a theory that tried to find a physiological means of explaining the inheritance of acquired characteristics. What united ideas about plant heredity was the drive for improvement, the will to be able to produce desired characteristics by intelligible means. As Helen Anne Curry has recently argued, amateur gardeners have long played a constitutive role in the development of plant heredity and plant sciences: not only conceiving of themselves as experimenters and part of a scientific discourse, but also in undertaking experiments and manipulations that fell beyond the interests or abilities of institutional figures.[238] As Curry argues in her work *Evolution Made to Order* (2016), a practical desire on the part of plant breeders stretching back into the 19th century to harness the powers in variation provided the basis for a lot of original and important experimentation.

The idea that mere accumulation of observations and 'experiments' could promote scientific cultivation was not one that passed without criticism. In 1832, a reader of John Loudon's *The Gardener's Magazine* wrote in to observe that the magazine provided almost no means by which the methods and techniques proposed by its contributors could be tested and proven to work in more than one instance. He further suggested that the vanity of having an article in the magazine

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238 H.A. Curry, 'From garden biotech to garage biotech: amateur experimental biology in historical perspective', *British Journal for the History of Science,* no.47, 3 (2014), pp. 539-565.

discouraged contributors from ever admitting that their methods or experiments never proved successful again.

> These persons, apparently from an ostentatious desire of bringing themselves and their plans before the public, or from some other mean design, have set forward, as a great acquisition to the horticultural world, the result of some experiments intended to set aside established methods of practice; but, being unable to substantiate their discoveries by reason, they are often obliged to appeal to their own success, or to what they choose to call undisputed facts. [...] have any of them had the honesty to publish their discontinuance of practices which they have found untenable, in order to prevent others from adopting their plans, at the risk of much trouble, expense and disappointment? No: not a single instance has appeared.[239]

Loudon used the letter as an opportunity to position himself against the elite of scientific publishing. "A magazine has this great advantage over collections of papers in what are called Transactions, that it admits of controversial discussion, which the latter do not; and therefore false doctrine, once admitted into such collections, stands there as true. In this respect, the Transactions of societies, in their present form, and in their present manner of publication, are behind the age. Fortunately the bulk and expense of these works prevent them from being generally read."[240] In other words, Loudon maintained that magazines like his own were better-equipped to keep up with scientific thought (and to draw false doctrine under fire) than more eminent titles.

In this chapter, I argue that a family of methods and ideas about how to breed plants was diffused and transmitted from the Horticultural Society by its 'eminent botanists' Joseph Banks and Thomas Knight. These ideas promoted an

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239 'On certain frauds imposed by correspondents upon the readers of transactions of horticultural societies', *The Gardener's Magazine*, no.8 (1832), p. 289.

240 See John Loudon's editorial reply in: 'On certain frauds imposed by correspondents upon the readers of transactions of horticultural societies', *The Gardener's Magazine*, no.8 (1832), p. 291.

understanding that variety in the plant kingdom had been produced by the inheritance of acquired characteristics. But by the 1820s and 1830s, a new competing literature that encouraged the practice of scientific gardening had emerged from SDUK and particularly from the editorial efforts of John Loudon and John Lindley. These publications drew the authority of Banks and Knight and of the *Transactions* into question. Practical gardeners, nurserymen, and plant breeders argued that their own experience and observations ought to be given greater weight. But the debate over who had the authority to speak on plant heredity was not limited to eminent botanists and practical gardeners. Medical writers and physicians, like William Benjamin Carpenter and Thomas Bushnan, also weighed in on the subject of plant heredity. The realm of plants was important to deciding questions over the unity of the human race, and also over questions as to whether nature provided evidence of a Curse, a fall from Eden.

While I separate gardening and farming as two separate sites of evidence production, this division is artificial. Authorities in animal breeding were often also published on the subject of gardening, and vice-versa. The magazines and periodicals dedicated to farming and gardening shared a readership and also a tremendous deal of content. This overlap was mirrored, arguably, in the views of the readership on animal and plant heredity. Marc Radcliff has suggested farmers and gardeners viewed transplanting single flowers into new soil in order to transform them into doubles as taking advantage of the same natural mechanisms that came from crossing the female sheep of a deteriorating stock with a ram from a different pasture.[241] Florists, cultivators, and livestock farmers, Ratcliff argues,

[241] M. Radcliff, 'Duchess Duchesne's Strawberries: Between Growers' Practices and Academic Knowledge', in S. Muller-Wille & H.-J. Rheinberger, *Heredity Produced* (London, 2007), pp.

"understood their practices of transforming sorts and species [as] the influence of human art on nature."[242] But what did these 'transformations' tell the practitioners about nature? How could botanists and gardeners reason back from experiment in the garden to uncover the natural laws of heredity?

This chapter proceeds by first examining the efforts by Joseph Banks and Thomas Andrew Knight to create a final source of scientific authority for all questions related to the cultivation of plants: the RHS. I then proceed to show how John Lindley, influenced by John Loudon and by his connections to SDUK, sought to communicate Knight's methods to a far wider audience: taking advantage of new sources of authority that were beginning to compete with the RHS. For Knight, a family of plant breeding methods that relied upon the belief that the habits and peculiarities adopted by a plant in its lifetime would be transmitted to its offspring served a special purpose: like other botanists of the era, Lindley pinned his future aspirations on the production of a new classification system. One of its principal benefits, according to Lindley, was that it made sense of graft-hybrids and other new varieties produced by cultivation: an impossibility according to the artificial system of Linnaeus.

From Lindley, I move to look at John Loudon and *The Gardener's Magazine*, focusing upon a series of cases explored in his magazine that influenced future debates over the inheritance of acquired characteristics. Medical writers and physicians, like William Benjamin Carpenter and Thomas Bushnan, also weighed in on the subject of plant heredity. I conclude by moving forward in time in order to show how some of the cases first reported in *The Gardener's Magazine* and *The*

205-229, p. 209.

242 Ibid., p. 210

Gardener's Chronicle informed Darwin's theory of pangenesis, and served as hallmark cases of the inheritance of acquired characteristics.

Joseph Banks and Thomas Knight: 'pointing out' the science of gardening

The establishment of the *Royal Horticultural Society* (RHS) at the beginning of the 19th century was meant to provide Britain's farmers and gardeners with a single source for scientific methods and principles in the cultivation of plants. In founding the RHS, Joseph Banks gave Thomas Knight the task of drafting the intentions of the new body. The *Report* that Knight ended up writing had a reasonably large circulation. As Murray Mylechreest in his (1984) observed, 250 copies were printed by the newly-established Society and these in turn were copied and reprinted by several periodicals, newspapers and magazines.[243] The tone of the *Report* informed potential readers and future members that it aimed to "point out some important improvements" in cultivation.[244] The idea was that the Society would provide a means by which the best means to cultivate and grow could be transmitted and diffused to an otherwise passive public, although Knight conceived that there could be some kinds of rewards offered to those that were able to produce desirable new varieties from seed.[245] Very quickly, however, the newly-established RHS became a means by which Knight could advance his views (largely shared by Banks) on the transmission of peculiarities. As I discussed at the close of chapter one, towards the end of his life Knight delivered a tremendously

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243 M. Mylechreest, 'Thomas Andrew Knight and the founding of the Royal Horticultural Society', *Garden History* no. 12, 2 (1984) pp. 132-137, p. 136.

244 T. A. Knight, *The Report of a Committee of the Horticultural Society of London, Drawn up at their request by T. A. Knight* (London, 1805).

245 Ibid., p. 1.

influential paper cataloguing all the instances of the transmission of inherited characteristics that he thought authoritative in the animal world. Knight shared with Banks an enthusiasm for the idea that a better understanding of how to encourage such transmission could improve the number of tropical and foreign varieties that could grow in Britain, and the *Transactions* in its early years served as an index of cases and observations that contributed to this view. In the first issue, Banks contributed some evidence on the power of plants to adapt their habits to the British climate and to transmit these new habits to their seedlings:

> It is probable that wheat, our principal food at present, did not bring its seed to perfection in this climate, till hardened to it by repeated sowings [...] In the year 1791, some seeds of Zizania Aquatica, were procured from Canada, and sown in a pond at Spring Grove, near Hounslow; it grew, and produced strong plants, which ripened their seeds; those seeds vegetated in the succeeding spring, but the plants they produced were weak [...] the seeds of these plants produced others the next year sensibly stronger than their parents of the second year. In this manner the plants proceeded, springing up every year from the seeds of the preceding one, every year becoming visibly stronger and larger, and rising from deeper parts of the pond.[246]

While the term 'inheritance of acquired characteristics' was seldom invoked by Banks or Knight, cases like that of *Zizania Aquatica* demonstrated to Banks that the changes introduced into an individual plant by its adaptation to a new climate would be fixed in the seeds. In accumulating these cases, a view of the relationship between the seeds of a plant and the climate was being forged.

Banks' dreams were not new. Efforts to systematically acclimatise foreign plants to the British climate date back at least to Pierre Belon's garden of acclimatisation, established in the 1500s.[247] At the same time, there was a pressing

246 J. Banks, 'On inuring tender plants to our climate', *Transactions of the Horticultural Society,* no.1 (1812), pp. 22-25.
247 B. Elliott, *Cultural Heritage Collections of the RHS Lindley Library*, (London, 2009), p.23.

need to acclimatise European plants to Australia's climate and soils, a question that was as pressing for Britain as it was the colony.[248] Thomas Knight, whose idiosyncrasy might otherwise have cause problems with his relationship to the Society (and it still managed to cause such problems), suited Banks' general aims and hopes for both the practical efforts of gardening and a brighter future for acclimatisation of foreign plants.[249] As Ray Desmond has observed, Banks was integral to giving Kew Gardens its new life as a point from which a "global transfer" of plants could be operated.[250] Banks was, during the early years of the establishment of the Horticultural Society, professionally invested in systematically acclimatising collections of plants from every region of the world.[251] "Banks asked diplomats, army and navy officers, merchants and missionaries to remember Kew's needs."[252] The belief that plants had an internal power to adapt their habits to new climates, and that these new habits would inform the seeds they produced, was one that perfectly matched Banks' own ambitions and best hopes for success at Kew.

Knight was an unusually reclusive figure for his time. Most of his work concerned his own vast estates of fruit trees, and much of his time was spent there as well – he did not leave Britain after an aborted attempt to visit France in 1790.[253]

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248 C.M. Finney, *To Sail Beyond the Sunset: Natural History in Australia, 1699-1829* (London, 1984).

249 Knight's arguments with Dr. Forsyth and Dr. Anderson – both potential members of the soon-to-be-established Horticulural Society, began with Knight's publication of a pamphlet alleging that Forsyth's patented gardening products had been sold to the public based on a method for filling holes in trees that did not work. See: T. A. Knight, *Some Doubts relative to the efficacy of Mr Forsyth's Plaister in Filling up the wholes in trees*, (London 1802). See also Mylechreest (1984). Forsyth and Anderson would have persuaded Knight not to join the newly-established Horticultural Society, but by 1805 Forsyth had died and Anderson had quit the project.

250 R. Desmond, *Kew: The history of the Royal Botanic Gardens* (London, 2014), p. 91.

251 Ibid., p. 92.

252 Ibid., p. 93.

253 See T.A. Knight, *A selection from the physiological and horticultural papers* (London, 1841), p. 10.

He was not overly-concerned to study the work of others and it was through the efforts of Banks that Knight's work and ideas attained the circulation and fame that they enjoyed.[254] His fame and notoriety came in no small part from his insistence, communicated to the Royal Society in 1795, that Britain's fruit trees – indeed, all of the cultivated plants that were propagated by grafting or budding – were doomed to decline with the natural life expectancy of the original plant.[255] By the 1800s, Knight was instrumental to the popularization of cross-pollination in order to produce seeds that would yield new varieties.[256] Knight's views sent reverberations through Britain's agricultural communities for decades, as they predicted that many key, trusted varieties would soon deteriorate. Banks secured for him his Fellowship at the Royal Society, the award of the Copley Medal in 1806, and the presidency of the Horticultural Society upon its foundation in 1805.

For Knight, the climate in which a tree was reared demanded the adoption of new habits on the part of the plant. Like animals, plants acquired new characters in response to the demands placed on them by their surroundings. Knight was one of the earliest supporters of the idea that the farmer could utilize this tendency in selecting seeds, as Knight predicted that the characters acquired by the parent tree would reappear in its offspring:

> In collecting the seeds, to sow, it must be remembered, that the habits, as well as the diseases of plants are often hereditary, and attention should be paid to the state of the tree from which the seeds are taken [...] I believe that this remark may be extended to every species of forest tree, and that the offspring of a stunted oak, the hardy tenant of a welsh mountain, and of another tree of the same species, the more fortunate and gigantic inhabitant of the deep rich

254 See Ibid., p.11. See also Fletcher (1969).

255 T.A. Knight, 'Upon the inheritance of decay among fruit trees, and the propagation of debility by grafting', *Transactions* (April 30th 1795), pp. 81-84.

256 Knight (1841), p. 13-14.

> loam, and mild climate, of Herefordshire, would each retain a large portion of the acquired character of their parents, wherever planted.[257]

For Knight, the vision of a scientific contract between himself and the readership was one-sided. Fellows could communicate letters to the Society, but there were no straightforward means by which readers could contribute their own efforts to demonstrate the validity of Knight's suggestions. Knight maintained that all fruit trees could communicate their adaptations to the climate to their offspring. But younger gardeners and botanists, such as John Loudon and John Lindley, wanted to take gardening and horticulture in a different direction. They saw the possibility of authority and fame built upon communities that not only followed their advice, but could communicate their own successes. In practice, the dream of gardening magazines that could fill their pages with content provided by practitioners and amateurs was only ever realised in part: the pages of Loudon's *The Gardener's Magazine,* and Lindley's *The Gardener's Chronicle,* contain some significant contributions by amateurs and practitioners, but neither yielded a consistent stream of experiments that promoted the ideas about plant heredity that the two men shared. Occasionally, however, their magazines did play as hosts to new cases and events that promised (however fleetingly) to validate their own ideas about acclimatisation, the transmission of fixed habits in plants, and the potential power to advance the science contained within graft-hybrids.

SDUK, John Lindley, and fixing the habits of cultivated plants

Lindley was remarkably fortunate in his early years; he formed close relationships to William Hooker, he served as Joseph Banks' librarian, and worked as assistant

[257] T. Knight, *A Treatise on the Culture of the Apple & Pear,* (London, 1797), p. 52.

secretary to George Bentham at the RHS. By 1828, he had been elected Professor of Botany at the newly-established London University, and was editing *Edward's Botanical Register*, an illustrated magazine dedicated to the introduction of new plants to Britain. His connections to the elder Hooker and Bentham had introduced him to the idea of the Natural System for botany at a young age. Popular for many years in France through the efforts of Augustin de Candolle, Lindley viewed himself as the messenger of a bold, new vision of nature: only species had any real existence in nature, and the idea of races or varieties, or genera, classes and families for that matter, had no real existence. Lindley became a contributor and reviewer for the SDUK, and while most of his textbooks were published elsewhere, the intended readership and audience was one and the same – and his goal, for the first decades of his career, was the communication of his System. For Stevens, Lindley's early textbooks represent what he terms "communication between the makers and users of classification."[258] He hoped to communicate the same principles of cultivation that Banks and Knight sought to communicate via the RHS, but at a price point that made them more accessible – at the same time, Lindley now turned these methods to work as evidence for his System.

Lindley viewed resistance to the Natural System as a product of the poor diffusion of botanical knowledge. In producing textbooks and treatises for a wider audience, Lindley could help himself to those recent observations that agreed with his views, and compile tomes of evidence in favour of his understanding of nature, and plant heredity.[259] In a letter to the SDUK committee, which Lindley was

258 P. Stevens, *The Development Of Biological Systematics* (New York, 2010), pp. 108-110.
259 This interpretation of Lindley's publishing habits differs slightly from Stearn, who viewed the

compelled to write after he had been too dismissive of a proposed title in botany that disagreed with his views, Lindley explained: "the English public is more likely to adopt the views taken by Dr Thompson than those of persons like myself whose doctrines are, I fear, popularly regarded in this country, in the light of rash innovations rather than of undisputed truth."[260] Lindley viewed botany as divided into two parties by the introduction of the Natural System, and he owned his position on the 'rash' side of the dispute.[261] What was needed, in Lindley's view, was a means of making all the evidence in favour of the Natural System more accessible. "There is perhaps no science which has undergone so great a change as botany within a very short period," he wrote to the committee. "A great number of recent observations are contained in books which are not likely to meet the eyes of any but persons whose attention is exclusively devoted to such enquiries."[262] Despite his admission that Thompson's views were more popular, the committee took away the view point Lindley hoped to communicate; the series was cancelled, and Lindley's own *Botany* series pushed forward. Lindley authored the second title, *Botany*, published anonymously by SDUK in four volumes (commencing in 1838), which Alfred Wallace studied in the crucial time before his travels.[263] As was common, Lindley produced anonymous titles for the *Society* which drew heavily from his own works; a fact that caused him to object when future editions of *Botany* were

proliferation of treatises and textbooks as aimed at his own students (Stearn (1999), p. 34).

260 SDUK Coll / J. Lindley, to T. Coates, February 4 1831.

261 Ahren Lester has recently published a short description of Lindley's relationship with SDUK, clarifying the relationship Lindley held to the two most important botanical publications produced by SDUK: *Vegetable Physiology* (1827) and *Botany* (1838) The first was written by Anthony Thomson, but its content reviewed negatively by Lindley, and discontinued after the first title. See A. Lester, 'Botanical contributions to the Library of Useful Knowledge', *Archives of Natural History*, 42, no.1 (2015), pp. 181-184.

262 Ibid., p. 182.

263 A. Lester, 'Alfred Russel Wallace's Introduction to botany through John Lindley,' *Archives of Natural History,* no.42, 1 (2014), pp. 175-178.

published under his name.[264] The Natural System was a good fit with the wider articulation of nature emerging from the young *Society*, and it also involved the goal of fostering wider involvement in the science, its (advertised) ease of adoption being a strong point in its favour.

The inheritance of acquired characteristics held two points of appeal to Lindley. Firstly, Lindley felt that all observations of the phenomena provided further evidence in favour of the Natural System. Secondly, as Stearn (1999) points out, Lindley was raised during a period in which the technological advances achieved by glasshouse heating seemed poised to place the reins of power over nature in the hands of the gardener.[265] Massive importations of exotic plants to England had recently become possible, and Lindley was an avid believer in the power of acclimatisation, which he understood as a process whereby habits adopted by the parent plant in the new climate became fixed habits in the offspring. The experiments and horticultural methods espoused by Thomas Knight constituted a third motivation. Lindley presented Knight as a champion of the view that, generation by generation, the effects of cultivation on plants were being communicated to their offspring.[266] At the time Lindley encountered these ideas, botanists were having some success in eliminating environmental variation by establishing "a homogeneous cultivation regime," as Muller-Wille and Rheinberger express it.[267] In other words, controlling the immediate circumstances of cultivated plants helped to mitigate against unusual development in the life of the plant, and

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264 Ibid, p. 184.

265 W. Stearn, *John Lindley, 1799-1865, Gardener-Botanist and Pioneer Orchidologist*, (London: 1999), p. 15.

266 J. Lindley, 'Obituary Notice of the late Thomas Andrew Knight', *London Athenaeum*, (May 19th 1839). Reprinted in *The Gardener's Magazine,* no.4 (1839), pp. 315-317.

267 Muller-Wille & Rheinberger (2012), p. 70.

Lindley, Knight and others really were witnessing tangible improvements in cultivated plants. But Lindley, as Knight had before him, saw in this a real and *permanent* effect on the variety, that informed the offspring of the plants.

Reared on the methods and ideas of Banks and Knight, Lindley strongly promoted the idea that cultivation and acclimatisation not only changed the habits of plants, but that these changes were fixed in the offspring. In the 1830s and 1840s, Lindley repeated this view in his treatises and textbooks, and *The Gardener's Chronicle*, under his editorialship, would later play host to several important cases concerning heredity. Lindley believed in the aims of SDUK and promoted, through his other writings and editorial work, a system of science that ran on the industry of amateur collectors, gardeners, and practitioners. "The elucidation of every thing that relates to England," he wrote in 1831, "should come from the hands of Englishmen."[268] In the production of his treatises and textbooks, Lindley promoted the goal of his relationship between two kinds of 'Englishmen' – the amateurs and practitioners that consumed his books, and the eminent figures such as himself, that took up the task of authoring the classification systems and compiling evidence that pointed towards nature's constant laws. "We hope," Lindley wrote in the first volume of his popular study of fossil flora, "that a work appearing periodically, may become the focus, as it were, of all the knowledge that will be gradually acquired in regard to this important subject: that it will keep the enquiry in sight of those, who, from their local position, will be able, most powerfully, to aid it by the examination of the remains within their reach."[269] Roy Porter, in the 1970s, recognised that geology in Britain relied upon the industry of amateur collectors;

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[268] J. Lindley & W. Hutton, *The Fossil Flora of Great Britain* (London, 1831-3), p. xxii.
[269] Ibid., p.xxiv.

but so too did the science of plant breeding and heredity.[270] Lindley remained more interested in promoting the methods of Knight than he did those supplied by the contributors to his magazines, but these same magazines proved a more important resource to figures like Darwin than did Lindley's own treatises.

The 1830s saw Lindley publishing a steady stream of treatises and textbooks on botany and horticulture. These volumes, despite the variety of titles employed, usually served the purpose of promoting the use of the Natural System by amateur natural historians, gardeners, and students of botany. In these early treatises, Lindley placed tremendous importance upon the idea, in his words, that "the forms of vegetation are controlled by peculiarities of climate."[271] Botany, like racial science and geology, was at pressure from Anglican authorities to accommodate the biblical narrative. Like the Unitarian physicians, including William Youatt, discussed in Chapter One, Lindley included in his account of nature the cumulative effects of adaptation to climate in producing the races and varieties observed; such a position also produced an understanding of God that did not involve individual acts of creation for the hundreds of thousands of distinct plant species that were believed to exist at the time.[272] For Lindley, the most important consequence of his Natural System was that it recognised the higher orders of classification as a mere convenience: the plethora of names used to distinguish varieties did not identify real divisions in nature.

In an early publication on horticulture (1831), Lindley set out his views on

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270 R. Porter, *The Making of Geology* (Cambridge, 1977), p. 167.
271 J. Lindley, *A Natural System of Botany*, (London, 1830), p. 319.
272 For Lindley's estimate of the number of plant species, see J. Lindley, *Botany: In Four Parts*, (London, 1835-8), p. 129. The botanist David Bishop, a student of John Loudon's and contemporary of Lindley, advocated a similar economy in D. Bishop, *Causal Botany* (Edinburgh, 1829).

what, according to contemporary physiological knowledge, was possible in the way of alteration and improvement of cultivated varieties. This pamphlet, as celebrated in the agricultural press was an "excellent and very cheap little work," which aimed at "the horticultural amateur, and the practical gardener."[273] Included, was the notion of progressive seed-saving, by which, Lindley explained, a habit introduced to an individual plant would eventually become fixed within the seed stock.[274] Lindley knew that chance variations occurred in seed stock, and that these held some promise to the gardener; but he had more interest in the possibility of fixing habits that occur in individual plants, and he drew heavily from Knight and Banks in promoting this view. As he explained, the seeds of annuals propagate the species, not the variety. *But*, Lindley maintained "although a seed will not absolutely propagate the individual, yet as a seed will partake more of the nature of its actual parent than of anything else, its progeny may be expected, as really happens, to resemble the variety from which it sprung, more than any other variety of its species."[275] Cultivation could, Lindley promised, effect this – but without proper method, "the race becomes deteriorated," and the desired characteristics lost.[276]

In his anonymous *Botany (*1835-1838), composed of four volumes, Lindley maintained that the immense variation within species was the cause of adaptation to different climates. Plants grown in low light lose their hairs and become spotted; plants grown in too much light tend to dwarf and grow velvety.[277] Cold climates could cause the plant to grow paler, while hot climates cause plants to produce

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273 J. Mearns, 'Culture of Vines in Pots', *The Horticultural Register*, no.2 (1833), pp. 490-497, p. 496.
274 J. Lindley, *An Outline of the First Principles of Horticulture* (London, 1832), p. 50.
275 Ibid., p. 49.
276 Ibid., p. 50.
277 Lindley (1835-8), pp. 131-2.

more wood.[278] Lindley wasn't merely reciting the views of farmers and plant breeders. Contained in these observations was the influence of De Candolle, who viewed a plant's circumstances as the site of a battle for survival.[279] Trevor Pearce has argued that De Candolle informed the views of Darwin and Lyell; but he also found a disciple in Lindley, who gave pride of place to the effects of climate and adaptation after his early encounter with De Candolle's views. While Lindley also explained that there is an 'inherent tendency' in plants to “throw off one tendency and assume another,” this was secondary to the grand effect of climate in producing the varieties observed in his day.[280] Hothouses provided experimental proof of this vision of nature. Lindley reminded his reader of “the common experiment of introducing into a hothouse the branch of a Vine growing in the open air.”[281] The action of the hot air, Lindley explained, caused the buds to become excited, and put the entire system of the plant in motion, even when the body of the plant was exposed to winter conditions. The behaviours of individual plants, for Lindley, always held the promise of explaining the occurrence of different varieties and fixed habits, by appeal to the idea that the changes in habit caused by changes in climate would be fixed in the seed.

Lindley had more at stake than his hope for agricultural improvement: from this, he found the grounds to defend his idea of spheres of creation. Promoting himself in the third person, Lindley encouraged the reader to imagine nature “to be an immense sphere, with rays converging in the *centre*, where they finally become

278 Ibid., p.132
279 T. Pearce, 'A Great Complication Of Circumstances' – Darwin And The Economy Of Nature', *Journal Of The History Of Biology*, 43 (2010), pp. 493-528.
280 Lindley (1835-8), p. 132.
281 Ibid., p. 97.

confluent in a point, which may be called the point of *identity*."[282] For Lindley, a centre (or sphere) of creation is just the appearance of a new species; climate, and the inheritance of adaptations and new habits acquired in response to climate, produce new varieties, described as 'rays' in his system. After time, a bewildering number of varieties appear across the globe, but the botanist ought to be able to perceive their affinities by looking to the physiological functions held in common. The promise of these 'spheres' upon which the Natural System was to be based were never realised; but the underlying understanding of nature endured in his thinking.

Nine year later, Lindley expanded on his views in his *Theory of Horticulture,* a work intended to provide the general reader with knowledge of observations that were otherwise limited to the *Transactions* and other costly treatises. Lindley related how Knight had fixed a habit in potatoes to grow larger roots by pinching away the flowers on successive generations.[283] He added a case where Knight had acclimatised Persian melons to the English climate, fixing their habits merely by "the complete and most careful preservation of the leaves from injury of whatever kind," a careful watering regimen, and the employment of brick tiles for heat.[284] From the seedsman and nurseryman Joseph Paxton, Lindley knew that seeds for 'the best annuals' were procured by growing the parent stock in warm dry soil, as the habit of excitability would then be acquired and transmitted to the seeds.[285] Through all these examples, Lindley believed that the seeds produced by a plant

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282 Ibid., p. 148.
283 J. Lindley, *The Theory of Horticulture* (London, 1840), p. 326.
284 Ibid, p. 320-1.
285 Ibid., pp. 314-15.

would fix the habits enjoyed by the parent. He drew from this the guiding principle for future horticulture: "The great object of the scientific gardener who desires to improve the varieties of plants upon principle will be, then, by artificial means, to bring the parent from which seed is to be saved as near as possible to that state at which he desires the seedling to arrive."[286] Such advice promised more than many farmers would have been able to prove with their own plants; but Lindley's *Gardener's Chronicle* kept track of successes. In 1849, the *Chronicle* featured the report of a very proud and delighted cultivator of cereals, Sir Michael W. Ridley, who boasted that he had acclimatised a variety of wheat cultivated in Van Diemen's Land to the climate of Northumberland, and that the seed he had gathered would fare as well as the parent stock.[287] Knight had claimed to achieve similar results decades before, and now a generation of farmers that had grown up on the advice diffused by Knight and Lindley were hoping to replicate their results.

With the creation of *The Gardener's Chronicle* with Paxton in 1841, Lindley hoped to emulate his friend John Loudon's *The Gardener's Magazine*. Both these magazines, as I discuss below, played host to debates over the methods and ideas proposed by Knight, and popularised by Lindley. Within these titles, not only could contradictions arise from practitioners, but so too could the seemingly-innocent debates over plant heredity take on fresh political dimensions, presaging their utilisation in debates over eugenics and race in the latter part of the 19th century. One of Lindley's most commonly-attributed quotes emerged from an editorial in *The Gardener's Chronicle* that Lindley may or may not have written himself, but

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286 Ibid., p. 325.

287 H.W. Wilson, 'Wheat and Maize', Read at the Royal Agricultural Society of England June 16th 1849, *The Gardener's Chronicle*, no.9 (1849), p. 379.

which expressed in plain print the relationship between plant breeding and the politics of marriage that Walker had made his subject a decade earlier:

> All experience shows that in every kind of created thing, be it man, or beast, or bird, the mysterious principle called life remains during the whole period of existence what it was at first. If vitality is feeble in the beginning so it remains. Weak parents produce weak children, and their children's children are weaker still, as imperial dynasties have sadly shown.[288]

The underlying anxiety that Lindley, Knight and Banks discussed in fruit trees and in cultivated plants always held significance in the human realm: a significance that became more vocal and important in the decades to come.

John Loudon and The Gardener's Magazine

So far I have introduced the mode of communication envisioned by Banks and by Knight, and its continuation by Lindley. I have argued that the means of cultivation and methods proposed by Knight and utilised by Lindley in defence of the Natural System helped to familiarise and diffuse the notion that the habits and peculiarities acquired by the parent are fixed in the offspring. So far, I have focused primarily on debates over seed selection and acclimatisation. But contemporaneous to these debates were other issues surrounding grafts, and the production of graft-hybrids, which had a tremendous effect on debates over the inheritance of acquired characteristics in the 1860s and 1870s. These debates carried across *The Gardener's Magazine* and *The Gardener's Chronicle*, and contributors were in a better position to report on 'experiments' involving grafts than they were in attempting to apply Lindley's proposed methods of seed selection. Grafting was practiced by more gardeners and amateurs than efforts at seed selection, which was left to seedsmen

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288 *The Gardener's Chronicle,* no.31 (Saturday, August 5th, 1854), p. 499.

and nurseries. The big question in the 1830s and onwards was whether or not the root stock could communicate peculiarities and habits to the graft, or scion. While the relationship of 'parent' and 'offspring' didn't apply in grafting, the question of whether the body of one organism could transmit its habits and peculiarities to a joined body was one that had obvious and immediate consequences for the inheritance of acquired characteristics.

Loudon co-authored a book with John Lindley at a very early stage in the latter's career – he didn't share in Lindley's professional success, but he did nonetheless share many of Lindley's views on improvement in nature and society. When Loudon was publishing his ambitious *Arboretum et Fruitecum* in 1838, he suggested in the first issue that: "to compare plants with men, we consider aboriginal species as mere savages, and botanical species, or according to De Candolle's classification, races and varieties, as civilised beings."[289] The 'gardenesque' aesthetic that Loudon promoted avoided the appearance of wilderness, and made prominent the art and craft of the gardener.[290] But it also conveyed Loudon's deep-seated belief that plants, with human kind, were being transformed towards a state of grace in part through the transmission of acquired peculiarities: civilization and cultivation slowly transforming (otherwise fixed) species towards perfectibility.[291] Where Lindley sought to promote the Natural System by means of demonstrating the ease at which plants could adapt new peculiarities and habits in response to climate, Loudon sought to promote the

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289 J. Loudon, *Arboretum et Fruitecum,* vol 1. *(*London 1838), p. 216.

290 See for example P. Elliott, C. Watkins and S. Daniels, *The British Arboretum: Trees, Science and Culture in the Nineteenth Century* (London, 2011). See also M. Simo, 'John Claudius Loudon: On Planning and Design for the Garden Metropolis', *Garden History,* no.9, 2 (1981), pp. 184-201.

291 C. Morris, 'The Diffusion Of Useful Knowledge: J.C. Loudon And His Influence In The Australian Colonies', *Garden History* No. 32:1 (2004) pp. 101-123, p. 113.

effects of civilisation on the plant realm. The capacity of plants to fix and transmit the improving effects of civilisation to their offspring was key to this vision.

Loudon founded *The Gardener's Magazine* in 1826. He is better remembered for founding the *Magazine of Natural History* than he is the *The Gardener's Magazine*, although the *Magazine of Natural History* would never enjoy the same success as his other venture.[292] Through his magazine, he indulged in a dispute for authority with Thomas Andrew Knight. Loudon shared many of the same hopes and visions of the future of plant science that Knight held, but sought a different source of authority: practicing, professional gardeners. They disagreed on one crucial point. Thomas Andrew Knight, the leading authority on fruit trees in Britain, had maintained since 1795 that there was no communication between the graft and the root stock. Loudon not only discounted Knight as an aristocratic dabbler with little practical knowledge, but actively sought to demonstrate – through his appeal to his readers for scientific observations of their own practices – that Knight was wrong, and that graft-hybrids were feasible. By the 1820s, publishers like John Loudon were contesting this model – Loudon's *The Gardener's Magazine* aspired to create a community of scientific-minded gardeners that would contribute the results of their practice to the magazine, creating a more democratic space for the advancement of science. In the first issue, as was common with such periodicals at the time, Loudon explained his mission: "the object of the Gardener's Magazine is the dissemination of useful knowledge; its subjects inexhaustible as

[292] The Magazine of Natural History struggled to reach sales of over 500 per issue. This was, however, not unusual for struggling scientific periodicals. See Susan Sheets-Pyenson (1981), see also C. Jackson and P. Davis, *Sir William Jardine: a life in natural history* (London 2001), p.153. We lack figures for *The Gardener's Magazine* but its wider circulation can be presumed given that its contents were almost entirely composed by reader-contributors, whilst *The Magazine of Natural History* consisted primarily of translations of materials originally published on the continent.

the vegetable kingdom, and among the most interesting that concern domestic life; its plan calculated to procure information from every possible source at home or abroad' its contributors belonging to every department of gardening and botany."[293] Many of the contributors to its first issues were already Fellows of the Horticultural Society, though other contributors distinguished themselves by the name of their employer and the garden over which they resided.[294] This was not, however, a passive process on Loudon's part. As Morris (2004) has argued, Loudon's model demanded a steady roster of reliable gardeners and authorities that could contribute original communications, and as this section elaborates, Loudon used his magazine as a pretence to invite communications from some of the most respected botanists of the time.[295]

Loudon routinely, in his own publications and in his magazines, set himself on the side of practical gardeners, and often wrote as though many mistakes and errors had been propagated by *The Horticultural Society* due to their lack of practical experience. For example, in his *An Encyclopaedia of Agriculture* (1835), Loudon took advantage of the different kinds of authority available in debates over breeding to advocate in-and-in over crossing. The problem facing Loudon was that the pinnacle figure in the world in which he published, Thomas Knight, believed in crossing (as discussed in chapter one). "*The above opinions*," Loudon wrote in relation to breeding in-and-in, "may be considered as supported by the most eminent practical breeders, as Bakewell, Culley, Somerville, Parry, and others, and

293 J. Loudon, 'Preface', *The Gardener's Magazine*, no.1 (1826), pp. iii.

294 An example of the common formula can be taken from the first issue "Willis, Mr Richard, Gardener to John Harris, Esq. Radford, Plymstock, Devon" (ibid., p.iv). Gardening magazines often featured reports on what new plants or means of cultivation were being employed in gardens around Britain, placing such gardens as the forerunners of institutions like Kew.

295 Morris (2004), p. 125.

by most theorists, as Coventry, Darwin, Hunt, Young, &c."[296] Loudon continues: "T.A. Knight writes in the Communications to the Board of Agriculture in favour of cross breeding, as do Pitt and others in the County Surveys, but mostly from very limited experience."[297] Knight's experience in crossing was no more limited than was Loudon's. But the authority wielded by Knight on matters of agricultural practice only extended so far as his opinions were in concurrence with those of practical breeders. Loudon never became a Fellow of the Horticultural Society, the Botanical Society, or the Linnaean Society. His distance from these organizations no doubt added to the spirit of opposition he wrote into his publications, although this never seemed to discourage Fellows of the societies listed from contributing their views in his publication. Jane Loudon, a horticulturalist in her own right, carried on this opposition of her husband to centres of scientific authority when she praised George Combe's *Constitution of Man*.[298]

Debates over grafting and graft-hybrids in *The Gardener's Magazine*

Grafting was a widely used method of propagating plants in the 19th century. But confusion over whether the union of two different trees produced one new tree, or whether all the buds on trees constituted individuals in their own right, made both the possibilities and the dangers of relying upon grafting important topics within the gardening press. An American correspondent, John Braddick, writing in 1826, clearly viewed the buds he collected in Europe as producing new varieties. He referred to the buds as "children of promise" and viewed the trees grown from buds

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[296] J. Loudon, *An Encyclopaedia of Agriculture* (London, 1835), p. 301.
[297] Ibid., p. 301.
[298] J. van Whye, *Phrenology and the Origins of Victorian Scientific Naturalism* (London, 2004), p. 137.

as having new qualities that made them distinct from their parents – new enough to merit new names and to be marketed as distinct varieties.[299] As grafting and budding were, both for Charles Darwin and for Loudon (and countless others), methods of propagation that shed light on heredity in plants, I treat the methods below as means by which an offspring (the bud) could be viewed as having transmitted peculiarities from its parent (the tree or vine), or as having acquired new peculiarities that it was then capable of transmitting. They are, in Braddick's words, 'children of promise', a phrase that suited this age of perfectibility and scientific progress in the cultivation of plants.

The question of whether a fruit tree was an individual or a 'swarm' made the question of plant breeding by grafting or budding, as I have mentioned above, more involved. But the readers of *The Gardener's Magazine* were keen to take sides, and out of their disagreements and disputes a new James Main, a farmer in Chelsea and frequent contributor to *The Gardener's Magazine*, thought that Erasmus Darwin's "hypothesis (for I shall not call it a sound doctrine) is plausible, in accounting for several of the phenomena of vegetation."[300] Erasmus Darwin had maintained that a tree was a swarm of individuals, owing to the power of buds to produce their own roots systems if cut and planted. [301] The reader thought that tulip breeders and diseases promoted Darwin's views, and thought that a generation of younger farmers could profit from adopting the view in their own practice. Main himself attacked the authority of Knight in future contributions, suggesting that fellow contributor had only ever been "led astray from the right path of science" by "his

299 J. Braddick, 'Present de Malines Pear', *Gardener's Magazine*, no.1 (1826), pp. 32-35.

300 J. Main, 'Outlines of Horticultural Chemistry', *The Gardener's Magazine*, no.4 (1829), pp. 200-205, p. 205.

301 E. Darwin, *The Botanic Garden, a Poem, in Two Parts* (london 1791).

complaisant deference to celebrated authorities."[302] The question of bud variation was to be solved within the pages of *The Gardener's Magazine* and other like-minded publications, by the methods of gardeners and nurserymen.

William Falla, a nurseryman whose debts would drive him to suicide in 1836, maintained that grafts and buds could transmit their properties to the host tree (or stock).[303] In the 1820s and 1830s, however, Thomas Knight's opinion was that the root was never changed or altered by the graft or cutting that was attached to it. The position was conservative in the sense that it limited what gardeners could achieve through artifice, and Loudon's contributors regularly challenged the idea. Having been selected to give an address to the Royal Horticultural Society in 1830, Falla contested Knight's authority on the question by citing instead the case of 'a gentleman' in Herefordshire, "who, having a very old Golden Pippin apple tree which was in a dying state, planted around it several young seedling crabs, and, then they had established themselves, engrafted or inarched them into the trunk of the old tree; the consequence was, that in the course of a year or two, the old tree became nearly as healthy as ever it had been, from the vigour that was infused into it by the sap of the young crabs."[304] By 'inarching' Falla meant that the new shoots were bent over and grafted back into the trunk, forming what would appear to the eye a lattice-work of hoops. Smocovitis (2009) observes that these practices, well known by horticulturalists and discussed in print since the 18th century, had a long history of documentation and debate.[305] But one of the instincts amongst both

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302 J. Main, 'Curtis's Botanical Magazine', *The Gardener's Magazine*, no.7 (1831), p. 60

303 William Falla's debts are recorded in 'Notice to debtors and creditors', *The London Gazette* no.1 (1835), p.887. His suicide is recorded in the *Newcastle Courant* (April 2nd 1836), p. 211.

304 W. Falla, 'On the utility of planting orchards in the district of the Socety,' *The Gardener's Magazine,* no.4 (1829) pp. 21-23.

305 V. S. Smocovitis, 'Darwin's Botany in the Origin of Species', in M. Ruse & R. Richards (eds),

editors and gardeners was to seek more trials and observations. The editors here included a special encouragement to their readers to repeat the experiment, but no later issue unfortunately records any such experiment.

Cases where bud grafting produced unexpected new varieties were communicated across the continent. Within the United Kingdom, stories where budding had affected some unexpected change in the plant were common. Nurserymen were most often the source of such accounts, given their accumulation of practical experience. A nurseryman in London, George Bliss, published his manual on arboriculture in 1841, and The Gardener's Magazine was quick to run a series of excerpts from the work. Among them was a significant account by Bliss of an experiment he had conducted in his youth:

> I remember many years back, when quite a boy, a common white jasmine which was growing against the house, and being fond, even from my earliest years, of trying experiments among trees, I took a bud from a striped jasmine, and budded a branch on the green; the bud grew, and what shoots put forth below the bud, most of them became blotch-leaved: this is a proof the bud or graft must have an effect on the stock.[306]

No matter the confusion over what kind of entity was produced by grafting, the communication of peculiarities from scion to root spoke of a general principle: physical properties of plants, whether the result of sport or the influence of climate could be directly transmitted.

In 1839, John Loudon first received notice of a flowering tree named *Cytisus Adami. Cytisus Adami* was produced by accident by Jean-Louis Adam, a nurseryman in Vitry, in 1825, but after it came to the attention of members of *La Societe d'Horticulture de Paris,* the tree gained enormous fame as a potential

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Cambridge Companion to the Origin of Species, (London, 2009) pp.216-236, p. 230.

306 G. Bliss, 'The Fruit Grower's Instructor', *The Gardener's Magazine,* no.18 (1842), p. 28.

instance of the much-sought after 'graft-hybrid', a hypothetical idea that by grafting one plant onto another, a mixture of the two could be produced. Graft-hybrids, as trees like *Cytisus Adami* were referred to, weren't straightforward cases of the inheritance of acquired characteristics; but they were important members of family of evidence used by later authorities to argue for the inheritance of acquired characteristics. They were interesting in part because of the power over nature that they promised. But they also clarified (for some) the role that the body of the plant must play in communicating its habits and peculiarities to its offspring, loosely defined. In short, graft-hybrids seemed to provide evidence that the characteristics of the offspring (in this case a bud) are decided by the *entire body* of the parent (in this case a graft of two different varieties). That was enough to make *Cytisus Adami* big news within the gardening world. Jean-Louis Adam, a nurseryman in Vitry, had been selling a purple cytisus for some years, for which he used the yellow-flowered Cytisus Laburnum as root stock. By grafting the purple flowers onto the *Laburnum* stock, Adam was able to produce tall, rather than squat, instances of *Cytisus Purpures.* Sometime in 1825 or 1826, one of his grafts produced a chimera, or a plant composed of two different somatic tissues that grew side-by-side in the same body. Adam sold the graft before it had a chance to demonstrate its uniqueness, but the monstrosity, as discovered several years later, yielded a mixture of purple and yellow flowers on the same tree.[307] A series of articles published by Pierre-Antoine Poiteau, and Nicolas-Joseph Prevost in the

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307 P.A. Poiteau, 'Notíce sur la maniére dont ont pu se former les orangers appeles Bizarréries', *La Revué Horticole,* no. 2, 6 (1832), pp.6-10. See also P.A. Poiteau, Nouvélles observátions sur le Cytise Adam. *Journal de la Societe nationale d'horticulture de France,* 12 no.124 (1838), pp. 5-8. Also, P.A. Poiteau, 'Remarks on the Cytisus Adami', *The Gardener's Magazine,* no.16 (1840), pp. 58-61.

years 1831-1834 had brought the tree to the attention of the world.

Loudon seems to have first learned about the tree in 1839, and published an account of everything he knew to have occurred almost 14 years before.[308] Loudon, eager to provide more evidence of variation in buds, wrote to Poiteau and requested his opinion on the plant. Poiteau obliged by summarising several pieces that he and others had written in the *Annales*. Poiteau, whose books were translated and advertised in *The Gardener's Magazine*, was happy to be contacted as the authority on *Cytisus Adami* by Loudon, and he took the opportunity (following Herbert's letters) to revisit the case. By 1841, Poiteau's thinking had shifted slightly. He had been quick to declare *Cytisus Adami* a new variety or species in 1831, but a nurseryman at Versailles, Pierre Bertin, had produced a cytisus on which three species grew from the same root. Poiteau was convinced that the sap of the tree was somehow circulating three separate species which 'burst forth' at different points.[309] Poiteau remained of the opinion that *Cytisus Adami* contained the germ of two unmixed species. Ordinary hybrids, Poiteau argued, partake equally of their parents. But this was no case of an ordinary hybrid, as the shoots on these plants demonstrated traits of separate varieties. In a letter written to *The Gardener's Magazine*, Poiteau thanked Loudon for singling him out as an authority on *Cytisus Adami* and set out his views on the plant and its significance for English readers.

Loudon wanted a respected British authority, and forwarded all of Poiteau's articles to the botanist William Herbert. Herbert had already risen to prominence in botany with his 1837 treatise on cross-breeding *amarylidaceae* (a bulbous flowering plant). In that work, Herbert had already, based on his brother's tree,

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[308] 'Aboricultural Notices,' *The Gardener's Magazine*, no.15 (1839), p. 122.
[309] P.A. Poiteau, 'Remarks on Cytisus Adami', *The Gardener's Magazine*, (1840), pp. 58-61.

argued in 1837 that communication between grafts and rootstock could produce a "distinct plant."[310] Now, he strengthened his position in his published reply to Loudon, writing to *The Gardener's Magazine* to assert his belief that *Cytisus Adami* "opens a field for the horticulturist to produce hybrid plants which perhaps could not be obtained by seed."[311] Herbert, like Erasmus Darwin, viewed every bud as an individual.[312] *Cytisus Adami,* in Herbert's opinion, had been created from a bud that grew on the seam between the tissue of the scion and root, allowing it to draw from both. Herbert's advice was just the kind that Loudon valued most: a new technique that could be employed by practical gardeners, discovered and diffused without the (direct) involvement of *The Horticultural Society.*

Herbert had long been interested in plant breeding and heredity, and while sceptical of acclimatisation and the inheritance of acquired habits in plant breeding, Herbert did not entirely rule out the notion.[313] He thought that work by botanists such as Richard Sweet, whose work on acclimatising roots was read before the Royal Horticultural Society, tended only to demonstrate the furthest powers of foreign plants to endure the British climate, and not a process of acclimatisation.[314] Herbert had believed in 1837 that new peculiarities only arose "by the accidental alteration of constitution in some particular seedling."[315] His position on Cytisus Adami in 1840 shows a marked change. Three years after the publication of his treatise, when faced with Poiteau's sustained treatment on the plant, Herbert

310 W. Herbert, *Amaryllidaceae,* (London 1837), p. 377.
311 W. Herbert, 'On the singular Origin of the Purple Laburnum,' *The Gardener's Magazine,* no.16 (1840), pp. 289-290.
312 See the discussion of Erasmus Darwin in P. Ayres, *The Aliveness of Plants* (London 2009), pp.17-21.
313 Herbert (1837), p. 347.
314 Ibid.
315 Ibid.

now thought that a new variety has arisen through the intermingling of root and scion in the production of a bud.

Herbert's reasoning was that the two different kinds of shoot that grow from *Cytisus Adami* are, in fact, markedly different from their parents, and thus he reasoned that the plant as a whole was a new variety, a distinct individual from either of the two plants from which its life began. *Cytisus Adami,* in Herbert's opinion, had been created from a bud that grew on the seam between the tissue of the scion and root, allowing it to draw from both.[316] He reasoned in the case of *Cytisus Adami* that “the bud which produced it was formed exactly at the junction of the bark of the two species, and that the two contributed equally to its formation.”[317] He abandoned his earlier position that accidental variation in seedlings was the source of variety. Instead, changes to the body of the parent plant (like grafting) were changes that could be communicated to new buds (offspring, for Herbert). Rejecting Poiteau's explanation that the plant was somehow home to a plurality of 'distinct species', Herbert recommended that cultivators could try to force the creation of similar buds shield-budding and then killing the bud on the graft, in the hopes that a similar formation of hybrid buds would form at the site of the wound.

In a largely forgotten chapter of correspondence on chance variation and experimentation, William Herbert entered into an eight-year experiment with Douglas Beaton, who served as gardener to Sir William Middleton.[318] Beaton had

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316 W. Herbert, 'Further Remarks on the Cytisus Adami', *The Gardener's Magazine*, no.16, (1840), pp. 381-383.

317 W. Herbert, 'On the singular Origin of the Purple Laburnum,' *The Gardener's Magazine* no.16 (1840), pp. 289-290.

318 See M.D. Beaton, 'Influence of Climate on Vegetation', *Magazine of Botany and Register of Flowering Plants* no.16 (1849), pp. 13-14.

written to *The Gardener's Magazine* to contest Herbert's assertion that he had developed a method to affect the seeds of Camellias while they were developing, in order to produce doubles instead of singles.[319] Herbert's belief was that by changing the conditions of the plant, the plant would alter its constitution. This alteration in the constitution of the plant would then be transmitted to its offspring, rendering it a permanent attribute.[320] Herbert had long been an experimenter and his results had been submitted frequently to the Royal Society.[321] Though Beaton's reputation did not extend beyond the world of gardening magazines, Herbert agreed to work with Beaton to try and reproduce his claim. If successful, Herbert would have demonstrated that by affecting the plant through altering its soil and climate, alterations in a seed that was already fertilised could be obtained. Unfortunately, Herbert died before the experiment had reached its end.[322] But the debate was attended to by the readers of *The Gardener's Magazine* and for a time Beaton and Herbert became names associated with the dispute over whether plants could transmit a constitution altered by climate or soil.

The magazine also raised questions concerning the ideas of Lindley; and while Loudon was in large agreement with Lindley's views on plant heredity and the potential for improvement, Loudon's magazine nonetheless became a site where practitioners could reject or call into question the views of Lindley. Richard Lymburn, a cultivator in Kilmarnock who frequently contributed to *The Gardener's*

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319 See M.D. Beaton, 'Treatise on cross-breeding', *The Gardener's Magazine* no.13 (1839) p. 276.

320 Beaton (1849), p. 13.

321 Herbert published results from various experiments on hybridisation in the *Transactions* of the Horticultural Society in 1818, 1819, and 1846. See: C. Darwin, *The Correspondence of Charles Darwin vol.11* ed. F. Burkhardt (London 1999) p. 111, fn.6.

322 M.D. Beaton, 'Influence of Climate on Vegetation', *Magazine of Botany and Register of Flowering Plants,* no.16 (1849), pp. 13-14.

Magazine, used the disagreement as an opportunity between Beaton and Herbert as an opportunity to side with practitioners like Beaton, and lump Herbert and Lindley together as authorities that were removed from practice and untrustworthy. “As to the acclimatising of plants,” he commented in regards to Lindley's *Horticulture*, “I am of Mr Beaton's opinion, that we cannot alter the constitution of a species, however much by circumstances we may affect individuals for a time.”[323] The gardener sides with the less eminent authority.

Debates over grafting and graft-hybrids in *The Gardener's Chronicle*

In 1857, some years after the first appearance of debates of *Cytisus Adami,* an unknown nurseryman wrote to *The Gardener's Chronicle* to inform the readers that he had succeeded in reproducing Adam's graft. The nurseryman, E. Purser, wrote to Joseph Lindley's *The Gardener's Chronicle* claiming that he had been able to repeat the production of a graft-hybrid between *Cytisus Laburnum* and *Cytises Purpures*:

> Laburnum Sports.--I forward a specimen branch of a Laburnum now growing in my garden. Some few years since three grafts of the Cytisus were inserted, and now the whole character of the tree is changing, and every year since losing the yellow flower of the Laburnum, and producing the short purple flower, as you see. I am not aware whether it is an unusual occurrence, but large branches (quite removed from the Cytisus) produced flowers of both characters, and are now in full bloom.[324]

Here was an ideal case: the scion affecting the root stock, confirming that his preferred interpretation of Adam's Laburnum was correct. Lindley knew the value of the testimony to his readers. “No point in vegetable physiology is of greater interest to gardeners,” he wrote, “than the *influence*, if any, of *the scion upon its*

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[323] R. Lymburn, 'Remarks and observations suggested by Dr. Lindley's Theory of Horticulture', *The Gardener's Magazine, no.*16 (1840), p. 430.

[324] E. Purser, 'Laburnum Sports', *The Gardeners' Chronicle*, no.16, (May 30th 1857), p. 382.

stock; or vice-versa."[325] Lindley, much as Prevost had almost two decades earlier, now put his own authority as editor into the task of legitimating Purser's experiment. Referring back to Adam's Laburnum, he wrote: "Here then are two notorious cases, the history of each perfectly ascertained [...] we are fully justified in assuming that similar changes, greater or less, will inevitably attend the union of any other two plants. We must regard such changes as resulting from some constant law, although we may continually fail to perceive its presence."[326] Lindley pushed that the two cases were now indications that "some constant law" was at work.

As Smocovitis observes, the years of 1857 forward were ones where Darwin was immersed in compiling botanical cases.[327] Smocovitis has argued that Darwin (and other botanists) were dependent upon these schools of technical knowledge that trafficked amongst gardeners and plant breeders, and in the case of Purser's laburnum, Darwin's interest was sparked; but also his suspicion. In the next issue, Darwin wrote a query to Lindley. Could Purser discover if the seeds were sterile? Were the leaves changed as well as the flowers? Darwin recounted his success in raising pure yellow laburnums from the seeds of Adam's Laburnum, and wondered if the idea of telegony – "as the physiologists have explained", might be proven true.[328] But the conversation sparked other, murkier questions from the readers of the *Chronicle.* A gardener, Mr Madden in Ballinasloe, wrote to say that he had observed yellow shoots on his purple laburnums several times.[329] Another gardener, George

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325 J. Lindley, J. 'Laburnum Sports', *The Gardener's Chronicle,* no.17, (June 6th, 1857), p. 400.
326 Ibid.
327 Smocovitis (2009), p. 222.
328 C. Darwin, 'Laburnum Sports', *The Gardener's Chronicle,* 17, (June 13th 1857), p. 401.
329 Madden, "Laburnum Sports", *The Gardener's Chronicle,* 17, (June 13th 1857), p. 454.

Fitt in Norwich, wondered why his laburnum grew yellow flowers on the left side and purple on right.[330] Lindley's *Gardener's Chronicle* was reaching the limits of what it could authenticate. Unlike the case in France, no one in Britain undertook to visit Purser, Fitt, or Madden. Lindley had no mechanism in place to sort out cases of 'irregular development' from those of genuine interest. And every triumph of cultivation that seemed to evidence the ability of the root to inform the scion inevitably produced a series of queries and letters that raised more questions and problems than did the example answer.

Despite Lindley's belief that he had successfully discovered and communicated a second incident of Adam's Laburnum, and Darwin's welcome suggestion that perhaps more such cases had now been observed, in his 1868 discussion Darwin rejected Purser's case as untrustworthy while maintaining faith in Jean-Louis Adam's. The testimony of gardeners in publications like *The Gardener's Chronicle* could be rallied when it supported the main bent of theory, but it could also be easily ignored when it seemed improbable. It took far less work to dismiss a gardener who contributed to the *Chronicle* than it did to legitimate and lend authority to the anecdotal cases submitted to the magazine. Still, by the 1860s, Darwin had decided that his opinion aligned with that of Lindley: there *was* a constant law at work, and Adam's Laburnum was evidence of its operation, even if Purser's Laburnums failed to convince him. Graft hybrids, he believed, were perhaps *the* best source of experimental evidence that could be obtained in support of his emerging notion of pangenesis, even if there were obvious challenges to repeating the fortunate accidents that had taken place in

330 G. Fitt, "Laburnum Sports," *The Gardener's Chronicle,* 17, (June 13th 1857), p. 421.

Vitry.

Decades later, after Lindley's death, a new case appeared in *The Gardener's Chronicle* that excited Darwin, and also his new assistant in researching pangenesis, George Romanes. Peter Grieve was the lifelong gardener to the Earl of Lanesborough in Culford. Darwin makes passing reference to having received a letter from him in regards to constitutional differences in varieties of flowers.[331] We have no record of his education but as he was not a Fellow of the Horticultural Society or the Linnaean Society, it is reasonable to assume that Grieve had begun his career apprenticed to a gardener and that his formal education was limited. In 1868, at the age of 56, Grieve brought out a two volume treatise on pelargoniums (geraniums), and he followed this with a number of letters sent to the *Gardener's Chronicle* until his death in 1897.[332] Grieve had hoped to gain Darwin's attention and favour during his career. He referred to new varieties that he cultivated as 'evolutions'. He worked on variegation in geraniums and was interested in the cultivation of variations, or Sports. His work on geraniums was admired by the Horticultural Society to the point that, after an exhibit of his geraniums in 1867, a reviewer noted:

> Practical men can at least speak with authority on this branch of the subject [variegation]. If their practice had been less carefully minute than that of scientific manipulators, it has at least been equally or more successful. By their fruits we are content to assess their skill, and I challenge even the great Darwin to place the species or varieties that he has originated beside those of Mr Grieve.[333]

Grieve, despite his publications and correspondence with Darwin was, for all

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331 C. Darwin (1868A), p. 394.
332 See R. Desmond, *Dictionary of British and Irish Botanists* (London, 1994), p. 299.
333 P. Grieve, *A History of Ornamental-foliaged Pelargoniums* (London, 1868), p. 124.

intents and purposes, a practical gardener. His authority rested on his practice, and by 1867 his experiments and work in plant breeding are being distinguished from those of 'scientific manipulators.' However, that didn't mean that Grieve's observations of plants weren't of value to figures like 'the great Darwin'. And in 1874 Grieve witnessed something that he thought extraordinary. In January 1874, Grieve chose to remove an unproductive graft of 'Golden Champion' (a grape variety) fully from its stock. That summer, the stock produced a bud that proved to be 'Golden Champion', even though Grieve had fully removed the graft from the stock.[334] He included an illustration to demonstrate to readers that no mistake on his part could account for the occurrence. “Here is another proof,” the editors commented, “that the scion [graft] does affect the stock even as the stock affects the scion.”[335] Grieve himself was sceptical that such communication was possible.[336] If it were so easy to affect the stock by grafting desirable varieties to it, why was it not common practice amongst gardeners and plant breeders?

Romanes, reading the letter, saw at once that it was potentially an example of pangenesis at work. Pangenesis, a theory that appealed greatly to both Romanes and Darwin at this time, predicted that the cells of a plant, animal, or human, communicated any changes in their form to the reproductive organs.[337] Grafting

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334 P. Grieve, 'Singular sport upon a grape vine', *The Gardener's Chronicle* (January 2nd 1875), pp. 21.

335 Ibid.

336 See Grieve (1868,) p. 52. “However sound or otherwise the doctrine may have been which he [Professor Bradley] may have been which he taught with regard to the circulation of the sap, I must confess myself somewhat sceptical as to the results of his experiments in producing variegation.”

337 Pangenesis has received a tremendous amount of attention. Kate Holterhoff has recently surveyed the receptions of the theory in the 1860s and 1870s scientific and gardening periodicals, arguing that the theory was far more influential and well-respected than earlier historians have admitted. See K. Holterhoff, 'The history and reception of Charles Darwin's hypothesis of pangenesis', *Journal of the History of Biology,* no.47 (2014), pp. 661-695. Earlier writers on pangenesis such as Endersby (2003) and Schwartz (1999) view Darwin's efforts to prove pangenesis as symptomatic of a turn towards Lamarckian inheritance. See J. Endersby,

was an interesting case study for the idea. If pangenesis were true, shouldn't grafting produce some change in the behaviour and growth of the root stock? The account submitted by Grieve, in fact, perfectly achieved what he and Darwin had been attempting to achieve in their own gardens. Grieve had observed (or so Romanes believed) an incidence where the cells of the scion, the 'Golden Champion' had communicated their form to the reproductive organs of the plant. Darwin, unfortunately, disagreed. “The case of vine in Gardener's Chronicle which I sent you I think may only be a bud-variation, not due to grafting,” he wrote to Romanes.[338] Darwin's hopes of providing experimental evidence of pangenesis with plants had, by the summer of 1875, begun to wane.[339] Some years later, Romanes would write to William Thistleton-Dyer, the assistant director of Kew Gardens, to ask whether it would be possible to try and repeat Jean-Louis Adam's grafting experiment, in order to demonstrate by experimental means the validity of pangenesis and the inheritance of acquired characteristics.[340] By the 1870s and 1880s, many of the plant cases considered decades earlier had become the most important potential evidence for the inheritance of acquired characteristics.

'Darwin on generation, pangenesis and sexual selection', in G. Radick & J. Hodge (eds), *The Cambridge Companion to Darwin* (Cambridge 2003), pp. 73-95. See also J. Schawtz, *Sudden Origins*: *Fossil, Genes and the Emergence of Species* (New York 1999). Others such as Ruse (1993) view pangenesis as an effort to fill in gaps in Darwin's overall theory. See M. Ruse, *The Darwinian Paradigm* (New York, 1993).

338 C. Darwin to G. Romanes, 12th July 1875, in E. Romanes, *Life and Letters of George Romanes* (London, 1895) pp. 40-41.

339 Kate Holterhoff disputes this, noting that while Darwin complained in correspondence to Haeckel that he felt his mental faculties were diminishing with age, he continued until the end of his death to publish on pangenesis (Holterhoff 2014, p.690). I think, however, that Darwin saw that efforts to experimentally prove pangenesis would always be made more complex by the fact that he simultaneously espoused his grandfather's views on bud variation, in that he held that individual buds represented discrete individuals with traits that could, potentially, vary from the rest of the plant (see discussion below).

340 G. Romanes to W. Thistleton Dyer, 1888. In E. Romanes, (ed.), *Life and Letters of George Romanes*. (London, 1896), p. 213.

The inheritance of acquired characteristics in botany and medicine

I have so far shown that gardening magazines contained a rich, observation-based dissection of the mechanisms of heredity. While the capacity of gardeners and farmers to supply the observations that Lindley and Loudon sought did not meet their expectations, both magazines still provided a space wherein gardeners and farmers could take part in the effort to demonstrate that the methods proposed by Knight, Lindley, and others, really did afford gardeners a power of plant heredity. This literature was, it is important to stress, far more open to speculation and different ideas about heredity than the literature produced by physicians and gentlemen of letters that chose to publish on the subject of plant science. I want now to turn to demonstrate that these debates had a direct impact upon medical thought, and discussions of race and religion in medicine. This final section anticipates the utilisation of botany within debates over heredity in the human case discussed in chapters 3-5.

As Peter Ayres argues in *The Aliveness of Plants*, botany had long been positioned through the 18th century as a branch of medicine – important, but dependent upon physicians for attention.[341] As I have shown thus far, this approach vastly underestimates the importance of gardening and nursery work to the development of botany. It also becomes apparent that, once we recognise the significance that gardening and practical experience played in the development of botany in Britain, many of the medical contributions to botany lacked the stamp of practical experience. They were more philosophical in their approach, often more

341 P. Ayres, *The Aliveness of Plants* (London 2009), pp. 23-25.

religious, and yet they are evidence of just how far the ideas about plant breeding and cultivation were influencing attitudes towards religion and humanity, particularly on the questions of race, degeneration, and the divine origins of humankind.

John Stevenson Bushnan has been largely omitted from the history of medicine and debates over the nature and origins of life, despite his prominence within the community during his life. Bushnan, like William Coulson (discussed in Chapter Three) and William Youatt (discussed in chapter one), began his publishing career as a contributor to the Society for the Diffusion of Useful Knowledge. He served as superintendent to several asylums, and for a time edited the *Medical Times and Gazette* prior to Churchill's purchase of the publication in 1852. Bushnan, like Carpenter, tried to maintain authority in several different branches of scientific publishing: he wrote on botany, on surgery, on psychology, but it would be a mistake to conclude that in doing so he was moving in and out of separate genres – Bushnan, like Carpenter, viewed plant and animal life as governed by the same natural laws that dictate human development and human heredity. Whether it was a fern or a medical case in an asylum that provided the illustrating point was not of great concern to Bushnan, and like Carpenter he was apt to draw from medicine when discussing plants, and vice-versa.

Bushnan and Carpenter's separate works on plant science were published roughly at the same stages in their careers. Comparing their motives and religious positions sheds light on how the works fit in to their wider ambitions. William Benjamin Carpenter composed his *Popular Cyclopaedia* on vegetable physiology during his failed efforts to conduct an affair with Ada Lovelace (he still dedicated the work to her).[342] Though he compiled the *Cyclopaedia* by recourse to gardening and botanical magazines, and the *Transactions* of the Horticultural Society, he still presented the work as Banks and Knight had styled the purpose of the *Transactions:* "The science of Vegetable Physiology has been but too little connected with the arts of the farmer and gardener;" he explained, "and they have consequently been working in the dark, frequently coming, after tedious and unsuccessful trials, to conclusions which might have been drawn immediately from scientific principles."[343] In its first edition, the volume was published anonymously, suggesting that the publishers perceived that they wished to present the work, like other cyclopaedias, as an anonymous work by multiple authors, rather than attaching it to the celebrity enjoyed by the author of the *Principles of Comparative Physiology*.[344] Later editions bore his name. A Fellow of the Linnaean Society and, by 1844, the Royal Society, Carpenter's early work on vegetable physiology was key to establishing his reputation as a talented young author that could write authoritatively on all branches of scientific enquiry (an ambition that was still reasonable in the 1840s). He used Lindley's *Ladies' Botany* as a means of familiarising himself with the Natural System, and largely followed the thought of Lindley throughout the composition.[345]

Adrian Desmond and James Moore have argued that Carpenter's encyclopaedias were all to the greater glory of his commitment to abolition, and

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342 Dep Lovelace-Byron / 169 / 233.

343 W.B. Carpenter, *Vegetable Physiology* (London, 1843), p. 125.

344 See for example, the review – 'popular cyclopaedia of natural science. part III. mechanical philosophy. part IV. horology and astronomy', *The Eclectic Review,* no.14 (1843), pp.545-553. also 'Popular Cyclopaedia of Natural Science- Vegetable Physiology', *British and Foreign Medical Review*, no.12 (July 1843), pp. 227-228.

345 Carpenter, (1843), p.vii.

finding evidence in nature in support of the race question.[346] But Carpenter was not so noble as that. He took time in the pages of his *Vegetable Physiology* to condemn Pacific islanders as reduced to a state of idiocy by the ease with which they could produce bananas, and suggested that the tropics had introduced a hereditary laziness and inability to reason.[347] He remained ambivalent on the question of hybrids as well, maintaining that only careful efforts to interbreed could ever decide the question of whether two parents were of the same species.[348] His whole-hearted devotion to abolition was to appear in later works (discussed in chapter 4), but even then he maintained a strong bias against the faculties and capabilities of non-Europeans.

What emerged from Carpenter's work was that he had no interest in continuing Lindley's rejection of progressive development. Carpenter used botany and gardening to reaffirm the validity of progressive development. In the discussions of generation, Carpenter advanced his earliest discussion of embryonic (or in this case, germinal) evolution. Discussing ferns, Carpenter explains: "In this very curious process, we see that the Fern passes, as it were, through the stage which is permanent in the Marchantia; but that when it attains a higher form, the organ, which was only for a time subservient to its existence, decays away."[349] Marchantia, a primitive liverwort that grows close to the ground like a moss, was perceived by Carpenter in the hierarchy of Creation to fall at a more generalized and simple stage than the fern; the fact that ferns resemble such a plant at a key

346 A. Desmond & J. Moore, *Darwin's Sacred Cause*, (London, 2009), p. 186.
347 Carpenter (1843), p. 527.
348 Carpenter (1843), p.293.
349 Ibid., p. 277.

stage in their development demonstrated that plant and animal life followed the same laws. Carpenter's commitment to progressive development, and his commitment to rationalism, fated him to eventually prefer the inheritance of acquired characteristics over spontaneous variation. After all, the circumstances of children raised in a Christian home must, over generations, have some means of improving the family line than the conditions in which the savage is raised. Progressive development, for Carpenter, always seemed to have something to do with climate and circumstances: a point that he developed in his Fullerian lectures in 1846 and 1847.[350] In those lectures, Carpenter maintained (when discussing the example of marine life), that: "we seem entitled to conclude further, that there was formerly less diversity than at present prevails in these *conditions of existence* – such as temperature, food, character of the sea bottom, ocean currents, etc – which so remarkably modify the distribution of the existing species of this class, and, which seem, indeed, to be (if I may so speak) the very source of their variety."[351] Carpenter, too, was digesting the views of De Candolle, and for himself, variations were almost always to be understood as some form of adaptation acquired by an individual in response to the demands of the climate that is then transmitted to the offspring.

Still, Carpenter was split on the question of the inheritance of acquired characteristics. He still occasionally viewed plant variation as evidence *against* the idea that all variations are the result of adaptations to climate. He wrote in 1843:

> There is, too, in many species a remarkable tendency to run into spontaneous variations, for which no external influences will

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350 W.B. Carpenter, "Swiney Lectures in Geology, 1847-8." Held at the British Library, BL Add MS / 1-21.

351 Ibid., p.16.

account. Thus the seeds of the same individual of the beautiful Fuchsia, now naturalised in our greenhouses and in the open air of the milder parts of Britain, have been known to produce plants, whose flowers differ so much in shape and in the proportional length of the calyx and corolla, that, if these had been collected and compared without the knowledge that they had been produced from one plant, they would have been regarded as distinct species, perhaps even (so striking is the difference) as distinct genera).[352]

But he freely acknowledged that climate and cultivation could alter the habits of plants, and that these alterations became hereditary. At some point in his compiling Carpenter learned that, "If the large Potatoes of European cultivation be planted again in tropical climates, the produce is little superior to that of the original stock; since, when circumstances no longer demand it, the acquired habit ceases."[353] While Carpenter was happy to uncover instances of spontaneous variation, the relation of climate to adaptation held more fruit for a Unitarian rationalist invested in understanding the inequality of the human races, and how Europeans had gained dominance. By the close of the decade, plants had become a key site of evidence for Carpenter in discussing the effect of climate on the human race, as I discuss in the next chapter. But it was in compiling his earlier volume on vegetable physiology that Carpenter gained the knowledge that made this connection and argument possible.

Bushnan, Botany, and the importance of Adam's Curse

In viewing physiology as a science that could be furthered by the inclusion of knowledge from botany, agriculture (and even geology), Bushnan was furthering the approach of his own teacher, Thomas Fletcher.[354] Thomas Fletcher stood out in

352 Carpenter (1843), pp. 314-315.
353 W.B. Carpenter, Vegetable Physiology and Systematic Botany (London 1848), p. 11.
354 See J.S. Bushnan, *The Philosophy of Instinct and Reason* (Edinburgh 1837), p. x-xi.

memory amongst his students due to the reforms that he pushed for during his time in Edinburgh – he attempted to move students away from employing Grinders (private tutors that helped them pass exams) and towards the private tutorship that he associated with Oxford.[355] At the time of his death in 1836, Fletcher was delivering a series of lectures that sought to arrive at the basic mechanisms governing life – to accomplish this, like many of his peers, Fletcher drew freely from plant science, agriculture, medicine, history and geology.[356] Bushnan revered his former teacher with the same zeal that he put into his Anglican faith – furthering understanding of Fletcher was, for the early years of Bushnan's career, as important as furthering appreciation of God's Creation.

Bushnan, as will be discussed in the next chapter, ranked among those asylum doctors that were inclined to view almost all madness as the result of heredity. The 1830s would be the decade of asylum reform in Britain. Bushnan at the start of his career was quick to ally himself with the necessity to build asylums that were in keeping with medical thought as to the nature of the disease and promote its curability. "The present Asylum," Bushnan wrote, preceding complaints that would be made by W.A.F. Browne six years later, "is eminently calculated to produce insanity, or at least to prevent, rather than promote the cure." Bushnan viewed such environmental causes of madness as linked to a wider rising in cases of madness, due to the frequency with which he believed a tendency towards mental disease was transmitted to offspring. "Insanity is frequently the result of an hereditary predisposition. This, indeed, has been denied by some writers; but their

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355 See 'Memoirs of persons recently deceased: the late Dr. Fletcher', *The Metropolitan Magazine* 16, (May-August 1836), p. 94.

356 J. Fletcher, *Rudiments of Physiology, in three parts* (London, 1835).

opinion has unhappily been confuted by the concurrent voices of those who have thought differently, and the irresistible evidence of daily facts. – Mysterious as the subject is, we have perpetual proofs that a peculiarity of mental character is just as propagable as a peculiarity of corporeal: and hence wit, madness, and idiotism, are as distinctly heir-looms of some families as scrophula, consumption, and cancer of others."[357] The idea that madness was caused in the first instance by excess emotions or unclean living, and that it was then propagated via heredity, fit into Bushnan's religious views: it cast madness as a disease of our own making, rather than part of God's original creation. This idea – that heredity could make sense of evil in nature in a way that conformed to Christianity, was one that held great appeal for Bushnan. In 1833, Bushnan, so far lacking any specialization in his young career, was visited by luck. A distraught mother came into his dispensary at Dumfries and claimed that worms had been found in her son's blood when let.[358] Bushnan had finished his education in medicine in 1830, lost his prominent and influential father in 1831, and married in 1832 – but he did not, as did William Benjamin Carpenter several years later, have an exciting or topical thesis that he could publish.[359]

Aside from some correspondence with Thomas Coates at the Society for the Diffusion of Useful Knowledge, Bushnan had no grounds on which he could make a reputation for himself in print. The strange case of the boy whose blood contained animals presented Bushnan with an opportunity not only to advance knowledge on

357 J.S. Bushnan, *Letter to the Noblemen and Gentlemen on the Necessity of Erecting an Asylum* (Dumfries, 1831), p. 7.
358 J. S. Bushnan. *The History of a Case in which Animals were found in Blood,* (London: 1833), p. 4.
359 Carpenter's publication of his thesis is discussed by Adrian Desmond in: Desmond (1989), pp. 200-210.

a rare disorder, but also to contribute to discussions about the origin of life. After outlining the particulars of the case of the boy that had appeared in his dispensary, and touring the history of such cases from antiquity, Bushnan proceeded to set before his reader the question of how such parasites originate. Rejecting the idea that such creatures were part of original creation, Bushnan argued instead that the worms are: "primarily generated, not from Ova at all, properly so-called, but spontaneously in each Organ of the Animals in which they are found."[360] Far from contradicting his faith, Bushnan used the idea of dissolution to explain the presence of evil and monstrosities in nature. Denying that such occurrences were acts of creation, Bushnan wrote: "Animals can create nothing: but they can form, out of ultimate elements, certain new compounds endowed with irritability which, when acted upon by proper stimuli, gives rise to the display of all the phenomena in which alone Life consists."[361]

Bushnan's *Introduction to the Study of Nature* followed the Romantic sentiments of the era – part physiological text, part homage to nature, Bushnan included a few of his poems alongside his discussion of vegetable physiology. Far from detracting from the seriousness of the work, however, these poems should be viewed as a testament to the level of authority Bushnan hoped to achieve – namely, his authority was not limited to the lower material details of plants, but extended to aesthetic considerations (a true gentleman). Bushnan's religion pushed him towards catastrophism so that the Deluge retained its biblical importance.[362] However, like William Youatt, Bushnan's religious sentiments also inclined him to

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360 Bushnan (1833), p. 52
361 Ibid., p.57.
362 J.S. Bushnan, *Introduction to the Study of Nature* (London, 1834), pp. 63-64.

believe that all life had been created according to the same hierarchical plan, and that the same principles were at work at the highest and lowest rungs of creation. That life can be altered by habit and cultivation was a key part of his views on madness and illness, and so too he looked to the world plant cultivation for its vindication. “Culture changes the very nature and habits of plants;” he wrote, “not only are the organs increased in beauty and in size, but by its agency they are even altered; plants, which in their natural condition are biennial, are by cultivation reduced to annuals, from the increased rapidity with which they are hurried on, in the performance of their several functions.”[363]

Bushnan had studied Joseph Banks, and he was inspired by the idea that cultivation could, across generations, slowly acclimatise a species to British soil and weather.[364] “It is by no means utopian,” he wrote, “to suppose we shall in time be possessed of many of the choicest productions of tropical countries.”[365] Bushnan's suggestion effaced decades of frustration and scepticism over such methods that had been collected and diffused through gardening magazines like that of Loudon. But as a reader himself of botany, Bushnan was interested in the larger picture, and he selected those cases that best supported his over-arching view. However, the possibility of creating a utopia was only one side of Bushnan's faith in the inheritance of acquired peculiarities. He also – as is revealed by his discussion of worms in the blood – was interested in degeneration, and gave this a religious significance. He thought that cultivation could, via the transmission of acquired habits, produce a utopia of gardening and farming – but he also thought that these

363 Ibid., pp. 185-6.
364 Bushnan's reliance upon Banks is extensive – see Ibid., pp. 188-9.
365 Ibid., p. 190

changes wrought upon nature were artificial and impermanent, and that if the Good Work of maintaining these trees was abandoned, they would quickly revert back to 'thorns, thistles, and every other noxious weed.'[366] The inheritance of acquired characteristics, for Bushnan, found validation in Adam's Curse; the account in Genesis of God's poisoning and twisting of the Earth so that it would no longer easily nourish humanity.

Bushnan was well-read, and familiar with the transformist views of Lamarck and of Buffon. He was at pains to distinguish that his belief in the inheritance of acquired peculiarities did *not* extend to an endorsement of transformism.[367] He did, however, believe that God had created a world where speciation by crossing *was* possible, as he viewed plants, like humans and animals, as being free to engage in unnatural activity. "Occasionally, from unnatural connections," Bushnan explained to his readers, "Some kinds of mixed monsters are produced."[368] Such new races, while permitted by God to arise, Bushnan reasoned, were sterile in order to prevent their 'disgusting' continuation. (One wonders if Bushnan really meant the innumerable hybrids discussed in his paean to nature to fall under this category). However, Bushnan took a kind of pleasure in the cruelty of nature and the hardness of life. He propagated the belief that trade was depleting England of organic matter, but the fact that crops were shipped abroad, taking with them an amount of organic matter drawn from the soil that was not replaced.[369] His treatises on vegetable physiology and nature became compendiums of anecdotes and ideas that

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366 Ibid., p. 182-3

367 "That climate and situation modify the character of animated beings is not to be denied, but none have either raised the brutes to the dignity of rational intelligence, or enabled them to dispute with man the claim to rank as the lord of the creation." (Ibid., p.154).

368 Ibid., p. 177.

369 J.S. Bushnan, *Principles of Animal and Vegetable Physiology* (London 1851), pp. 221-222.

fit his view that the natural world laboured under a curse stemming from Adam's fall, and that while diligence and science could Improve it, the natural tendency in all things was to deterioration, degeneration, and death.

Conclusion

The plant kingdom had, in the hands of medical writers, already become a source of evidence for understanding heredity. For the vast number of botanists, nurserymen, farmers and sundry contributors to publications like *The Gardener's Magazine*, the concerns they had over how best to propagate desirable traits and habits in plants were limited to the commercial sphere. This emphasis on the commercial made the *promise* of the inheritance of acquired characteristics particularly tantalising (if it could be demonstrated to be true).

At the same time, the profusion of advice, method, and 'scientific experiment' described in the magazines and encyclopaedias of the era gave plenty of cause for frustration and distrust. A plethora of suggestions and cultivating methods were submitted to gardening magazines: all contributors claimed authority as practitioners, but few, as was already observed in the 1830s, were willing to retract their claims when further experimentation failed. In the pages of these magazines, eminent authorities like Banks, Knight and Herbert found their opinions contested and the reporting of observations and experiments that worked against their views on the cultivation of trees and plants. At the centre of these debates, the inheritance of acquired peculiarities found a new life in debates over grafting, cutting and budding. While neither gardeners nor botanists had a clear mind as to whether or not these methods of cultivation produced an *offspring* of the parent tree or vine, the debates that ensued, as I have argued, were taken to have direct consequence on the question of whether changes in climate could effect changes in constitution, and whether these changes were, in turn, propagated down the line.

The few cases supplied by gardeners to the magazines created by Loudon and Lindley evidence a wider success, I argue. Gardeners – amateurs and professionals alike – were attentive to the theories of plant heredity put forward in their magazines and in textbooks, and they sought to prove for themselves the questions over graft-hybrids, and over seed selection and acclimatisation. Further, as in the case of Purser, their contributions were of immediate and significant importance to the highest levels of activity – the Darwins of botany, who realised that the behaviours of the plants that interested them most could be revealed in any garden, despite their best attentions to their own. These figures tied into a wider relationship between gardeners and scientists that extended into the early 20th century. As Helen Anne Curry has argued, "amateur gardeners hoped to, and did, put these techniques to use is attested to by their published accounts, their correspondence with scientists, and news reports of their work."[370]

While the term 'inheritance of acquired characteristics' is absent from the literature considered in this chapter, this provides a very interesting means of analysing *how* widespread belief in the inheritance of acquired characteristics emerged from this level of activity and observation. This chapter has shown that while the term is absent, what is present in the textbooks and magazines of the day is a tremendous effort to understand how the habits of an individual plant can be fixed in its offspring, and how the habits and characteristics of the root stock can

370 Curry (2014), p. 544.

be made to communicate themselves to the graft or scion. The immediate practical concerns that led to the formulation of these questions – and the experimental means of trying to decide them – lend in many ways the best evidence to the claim that gardens and greenhouses were a site of activity producing evidence required by the emerging science of heredity. Gardeners did not have a 'fundamental belief' about the inheritance of acquired characteristics that authorities then weighed for truth; instead there were fundamental questions about the road to improvement, the degree of control that gardeners could exert over nature, and the means by which genuine methods could be distinguished from false methods.

Where does that leave the question of religion? Again, bracketing the question of the personal faith of John Lindley, or John Loudon, we find in the writings of these figures the same promise of improvement as we do in the writings of Bushnan. If the principles of gardening were followed, the best traits of cultivated plants would, over time, become part of their nature. Lindley declared himself a gradualist in his (1832) *The Fossil Flora of Great Britain,* and he rejected the notion that fossil records of plants supported the idea of progressive development.[371] Keeble, one of his first biographers, promoted a reading of Lindley that suggested he was an unconscious precursor to Darwin.[372] Stearn, meanwhile, views Lindley's comments on progressive development as a rejection of the idea of evolution.[373] Most likely, Lindley maintained a nominal role for the Creator in his system out of perceived pressure from Anglican authorities. But more importantly,

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371 Lindley & Hutton (1832), p.xvii. See also: P. Stevens, *The Development of Biological Systematics* (London, 2010), p. 110.

372 F. Keeble, 'John Lindley', in F.W. Oliver (ed.), *The Makers of British Botany* (London: 1913; 2010), pp. 164-178, p. 174.

373 Stearn (1999), p. 171.

Lindley avidly promoted an understanding of nature wherein the Creator has written into plants a means of improving them by civilisation and cultivation, and the responsiveness of the individual is the key to fixing improvements in the race that will last so long as civilisation (cultivation) is maintained. Lindley and Loudon both encouraged their readers to perceive and experience their gardens as actual sites of this process. For Loudon, wilderness enjoyed the same spiritual position as savages in relationship to civilised Europe. And for Bushnan, wilderness was immediate evidence of a biblical curse. The health of cultivated plants (and anxiety over the ability of Britain to maintain its current stock), served as a means by which the dream of improvement and the fear of deterioration could be played out. For many lecturers like Lindley, religion was a more active part of their lectures than it may have been their writing. As Secord argues, "Science lecturers often had passionate views on religion; many were evangelicals and followed a lecture circuit much as Nonconformist preachers might have done."[374] Once the topic of transmutation had been introduced to botany, the inheritance of acquired characteristics remained a safe hypothesis. In John Balfour's *Botany and Religion*, written in the wake of the evolutionary ideas being published in the 1850s, he explains to his reader that law by which adaptations to climate can be transmitted to offspring does not upset the fact that species are immutable and exist in nature.[375] By Balfour's time, a culture had emerged in scientific letters that perceived the inheritance of acquired characteristics as a safe and uncontroversial idea, one that helped to maintain new ideas about the origins of races and varieties within some (widely conceived) theological boundaries.

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374 Secord (2003), p. 450.
375 J. Balfour, *Botany and Religion*, (London, 1859), p. 354.

Adrian Desmond maintained in his (1989) study of evolution that "English natural theologians had long held that the adaptation of an animal or plant to its niche was a sign of intelligent design."[376] Like adaptation, the possibility of improvement also was presented as testament to intelligent design. And this 'sign', the testimony of improvement, was one that was of crucial importance in establishing communities of readers for the editors of magazines like Loudon and Lindley. While radical Lamarckians made their own use of the language of the inheritance of acquired characteristics, those in the business of promoting a science of gardening, or botany, focused on making connections for their readers with ideas already familiar to them (or at least, ideas that they were told were already familiar to them). For an audience already literate in perceiving the inheritance of sin, or poor cultivation and management of a farm, ideas of acclimatisation, of fixing new habits so that new generations of seed carried improvements with them, and the dangers that poor cultivation held to their stock, reaffirmed in a new terminology ideas already familiar. Appealing to religious ideas was an important part of establishing the appeal and the utility of such ideas.

Finally, Lindley, Loudon, Bushnan, and SDUK, all had books and magazines to sell, and they were all invested in the idea of raising a generation of scientific gardeners and amateur botanists. As Secord has argued, the 1840s were the decade in which the scope of the market for inexpensive scientific books was fully realised.[377] The reading public of the 1840s were still one that conceived of the natural world in terms of the Creation, the Fall, and the Flood, and both writers and editors wrote to communicate scientific language and ideas with this audience as the decider of

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376 Desmond (1989), p. 110.
377 Secord (2003), p. 146.

their financial success.[378] Appeasing clerical authorities suspicious of radical and materialist writings was certainly a concern; but communicating a scientific approach to plant breeding and improvement was always going to be nested upon the perceived beliefs and worldview of the reading public.

[378] Ibid., p. 57.

Chapter Three: Asylums, the inheritance of acquired characteristics, and the phrenological press

Introduction

On the 19th of October in 1846, Maria Hopkins and her daughter Sarah were both admitted to Camberwell pauper asylum. Maria Hopkins suffered from paranoia and delusions (she was diagnosed as a monomaniac), while her daughter Sarah was prone to epileptic fits accompanied by violent rages.[379] Camberwell's physician recorded the predisposing cause of the daughter's illness as hereditary, and on a second page, wrote that there was no known predisposing cause for the mother's illness. In other words, some accident had befallen the mother's mental constitution in life that had been transmitted to her daughter. She might have been intemperate, or had poor hygiene, or suffered a great tragedy earlier in life. John Hayball Paul, the physician who diagnosed the mother and daughter at Camberwell asylum, didn't consider the case extraordinary. By 1846, an increasing number of asylum doctors believed that injuries to one's mental constitution would reappear as epilepsy, monomania, melancholy, idiocy and paralysis in one's offspring.[380] Bernd Gausemeier recently highlighted the idea in his discussion of what he terms 'pedigrees of madness.'[381] "Even 'oddities and eccentricities' of

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379 See Camberwell Case Book 1846, Camberwell Asylum House Archives (held at the Wellcome Trust) hereafter: RCPPSYCH/X1/001.

380 Foucault makes parenthetical mention of the theory in his discussion of 'degenerescence' and 19th century medicalisation of sexuality. To quote: "(look into the genealogy of an exhibitionist or a homosexual: you will find a hemiplegic ancestor, a phithisic parent, or an uncle afflicted with senile dementia)" M. Foucault, *The History of Sexuality. An Introduction,* Trans. Robert Hurley (London, 1984), p. 118.

381 B. Gausemeier, 'Pedigrees of madness: the study of heredity in nineteenth and early twentieth century psychiatry', *History and Philosophy of the Life Sciences,* no.36,4 (2015), pp. 467-483, p. 470.

relatives," he notes, "could count as a proof that a patient's madness was hereditary."[382] How did these vague and transitory details about a patient's family history – often gleaned from the patient's own testimony – become 'proof', evidence of hereditary madness? Porter, in his studies of 18th century medical journalism, asked: "who authorized medical truth? Wherein was it grounded?"[383] When we look to early 19th century medical truth, we find that the idea of 'the inheritance of acquired characteristics' is taking clear shape in medical literature at the same time as patient testimony is becoming constitutive of diagnosis and treatment in cases of madness and diseases of the mind.

John Waller's article on hereditary disease in this period showed that at a general level, concerns about hereditary illness ran deep in Victorian Britain. Obtaining insurance, marriage – numerous areas of family life were governed and determined by 'investigation', at the hands of insurers or concerned family members, into one's family line.[384] Waller notes that "few doctors questioned the orthodoxy that hereditary maladies had their origin in acquired conditions."[385] However, Waller also is quick to evaluate the scanty evidence upon which this generation of doctors and medical writers placed their belief in hereditary illnesses, noting that the 'statistical data' was far too poor to justify it.[386] For Waller, this orthodoxy arose as what he terms a 'by-product' from the framework of constitutional medicine, which was dominant at that time.[387] Other historians have

382 Ibid., p. 474.
383 R. Porter, 'The Rise of Medical Journalism in Britain to 1800', *Medical Journals and Medical Knowledge*, (London 1992), pp. 6–28, p. 9.
384 J.C. Waller, 'The Illusion of an explanation: the concept of Herditary Disease, 1770-1870', *Journal of the History of Medicine and Allied Sciences,* no.57, 4 (2002), pp. 410-448.
385 Ibid., p. 415.
386 Ibid., p. 421.
387 Ibid., p. 414.

demonstrated that social and religious values contributed to shaping this view of human heredity; still others have pointed to efforts to eliminate crime and disease (what we could term Utopian ambitions) as contributing to the popularity of the idea.[388] In this chapter, I argue that the inheritance of acquired characteristics gained new acceptance and relevance as patient testimony became an important factor in diagnosing hereditary cases. The fresh medical interest in a patient's ability to give account of his or her family, although flawed and limited, nonetheless produced a new means by which doctors and medical writers could contribute to larger debates within the medical and phrenological press.

This chapter argues that phrenology played a vital role in providing both a framework for thinking about hereditary mental disease and also a platform for sharing and communicating interesting cases, both those collected by asylum doctors and those submitted by amateurs and phrenologists of different professions. Mental diseases were only a small family of ailments that doctors came to regard as hereditary in this period. However, the anxieties and interest attached to mental disease were more poignant and rich in family detail than those attached to consumption, phthisis, gout, and other hereditary ailments. In a word, hereditary madness was more provocative to readers, and it was also inextricably linked to the popularisation of phrenology. While SDUK rejected phrenology, phrenological societies and magazines sought to position themselves not only as useful knowledge, but as a practical science that would develop and grow through

[388] See for instance A. Luchins, 'The Cult of Curability and the Doctrine of Perfectibility: Social Context of the Nineteenth-Century American Asylum Movement', *History of Psychiatry,* no.3, 10 (2002), pp.203–20. Andrew Scull has paid particular attention to the utopian aims of mad-doctors in the early 19th century. See A. Scull, *Madhouses, Mad-Doctors, and Madmen: The Social History of Psychiatry in the Victorian Era* (London, 2015).

public engagement and involvement.[389] Of the medical writers considered here: Jules Baillarger, Thomas Laycock, W.A.F. Browne, John Hayball Paul, and Richard Poole in particular – all of them maintained commitments to phrenological ideas, and their interest in the inheritance of acquired characteristics was tied to this commitment. Not only did asylums present a key site of evidence-production for the inheritance of acquired characteristics, but phrenology provided a system of knowledge by which this evidence gained wider diffusion and consumption.

In this chapter, I focus on the significance of a fresh interest in patient testimony as one of the critical means by which evidence of the inheritance of acquired characteristics was attained. It was not the sole means: doctors had other means by which investigations into the family histories of patients could be attained. For instance, John Thurnam, surgeon at Samuel Tuke's Retreat at York, used the resources of the Quaker church and communities to come to determinations about his patients. In his statistical work of 1845, he explained: "many cases, which were not stated to be hereditary by the relatives and friends, have, in this estimate, been considered as such, in consequence of more private information, or of the fact being well known."[390] However, the idea that patients *could* provide key evidence in their own diagnosis was new, and it helped to constitute the basis on which stories about the inheritance of acquired characteristics could be shared and diffused through medical and phrenological

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389 The *Penny Cyclopaedia*, while targeting a wider audience than a scientific elite, nevertheless was an important institution that bestowed authority or withheld it from schools of thought and figures in Britain. I will discuss the SDUK *Penny Cyclopaedia* further in chapter 4. In 1832, Sir G S Mackenzie, wrote to the Society requesting that they reflect popular demand with an entry on Phrenology. Thomas Coates, then secretary for the Society, responded that the opinion of the editors was such that Phrenology constituted neither knowledge nor utility (see: "Phrenology and the Penny Cyclopedia." *The Phrenological Journal*. 8. 1833 pp. 286-7).

390 J. Thurnam, *Observations and essays on the statistics of insanity* (London, 1845), p. 77.

media.

The idea of the 'hereditary' was a feature of the language employed in *The Phrenological Journal* from its first issue.[391] Bill Jenkins, in his treatment of the Combe brothers, has argued that their investment in the inheritance of acquired characteristics was part of a common-held and almost ubiquitous general sentiment: “It seems that his espousal of the inheritance of acquired characteristics was not considered important or contentious enough to merit a mention, let alone refutation, in published accounts of his theories.”[392] In fact, I argue, the efforts to compile and diffuse such cases did, at the time, conflict with other views. This dissent is important because it helps us to better appreciate the importance of evidence in the debates over the idea. While pervasive, there were still important figures that needed to be won over, a fact that helps us to understand why these cases were compiled and such stress placed upon their veracity.

Asylum statistics, new standards in issuing medical certificates, and better attention to testimony from patients about their own illnesses, all offered new means by which the asylum could produce not only a new understanding of authority, but one that was based on the application of scientific principle. In practice, the anecdotal stories about patients' families that emerged from this enthusiasm bore little difference from the anecdotal stories about nursery plants and domesticated animals considered in Chapter One and Two. And as I will show in Chapter Four, physiologists and other authorities helped themselves to stories about lunatics, plants and domesticated animals in equal measure when making the case for the inheritance of acquired characteristics. In this chapter, I begin by

391 See 'Spurzheim on Education', *The Phrenological Journal*, 1 (1824), pp.578-590, p. 581.
392 Jenkins (2015), p. 465.

looking at the wider contexts of asylum reform and influence from the continent. I then examine *The Phrenological Journal* and argue that the magazine maintained an interest in diffusing evidence of the inheritance of acquired characteristics – particularly gleaned from asylums – for over twenty years. In order to advance my argument that attitudes towards patient testimony played a pivotal role in establishing how evidence of inheritance of acquired characteristics could be produced, I look to the methods and efforts of various asylum doctors as well as the teaching methodology of Thomas Laycock in training his students. As I proceed in the chapter, it will become apparent that no asylum doctor had as many clear cases of hereditary insanity as their insistence would suggest. Browne often seems to maintain a position that most cases of insanity are probably hereditary; but in his published cases he is only able to rally several to the defence of the idea. In itself, I argue, this is interesting, as the very absence of clear cases points to a demand for them. Writers like W.A.F. Browne proceeded in their arguments by accumulating and deploying cases that were either their own or known to them. In the 1830s and 1840s, it becomes clear that exactly *how* to observe and present a case where a case of madness was also evidence for the inheritance of acquired characteristics – let alone for hereditary insanity.

Influence from the continent and reform

The exposure of conditions in private asylums and cottages in England and Scotland by the 1815-1816 Select Committee on Madhouses exposed not only horrific and shocking conditions, but argued that there must be a body composed of outsiders to inspect and oversee the proposed new asylums in order to protect the inhabitants of asylums from their doctors, keepers, and governors.[393] By taking part in criminal cases, doctors exposed themselves to further ridicule by the wider scientific community. “Everyone knows how little value is attached to the evidence of medical men in cases of lunacy,” wrote one reviewer, “on account of the wild and fanciful notions which they often bring into court with them.”[394] But as Roy Porter has argued, the importation of new ideas, new methods, and new approaches to insanity by alienists, physicians, surgeons, and asylum governors in the first half of the 19th century, was necessary in order to reclaim both reputation and authority.[395] This came during a time when, as Gausemeier has observed, German and French asylum doctors were pioneering statistical investigations into family illness, creating at the same time a new genre – a new language of legitimacy – which would have its effect upon British medical writing. "Psychiatrists had been using comprehensive family histories throughout the nineteenth century.” Gausemeier writes. “While published works relied heavily on statistical tables, the study of 'deep' pedigrees constituted a form of tacit knowledge that informed psychiatric thinking about heredity."[396] As the historians Jean and Irvine Loudon have argued in numerous studies, the medical periodicals of early 19th century Britain served not merely as sites where medical evidence accumulated: they also provided what the

393 A. Scull, C. Mackenzie, N. Hervey, *Masters of Bedlam* (Princeton, 1996), pp. 93-94.

394 'Prichard, Esquirol, Allen, Ellis, Ferrarese, Greco, Farr, Crowther, etc, on insanity', *British and Foreign Medical Review,* no.7 (1839), pp.2. This criticism came even before the scandalous trial of Edward Oxford in 1840, declared insane after being tried for treason when he fired a pistol at Queen Victoria and Prince Albert. John Connolly, a prominent physician with ties to the phrenological school, would come under immense public criticism for his role in the case as medical inspector of Oxford's condition.

395 See, for instance, Porter's concise treatment of this position in: R. Porter, *Madness: A Brief History* (Oxford, 2002).

396 Gausemeier (2015), p. 474.

Loudons describe as 'corporate identity'.[397] Interest in statistical studies of family lines was not an immaterial new paradigm within the management of asylums; rather, it was a new genre of medical writing, and one that was accessible by any surgeon or doctor stationed at an asylum and capable of presenting a table or a study of their patients.

Alienists in post-revolutionary France were subject to their own situation, placing pressure on their own state for increased public health programmes (not the least to provide employment for the great number of physicians and surgeons being discharged from the army after 1815).[398] It was within this climate that Esquirol, between the years of 1810 and 1817, began to travel to asylums across France with an aim to collecting statistical data to further his arguments for the necessity of increasing the funds devoted to the establishment of asylums and the treatment of madness.[399] Esquirol was the first in France to organise such ambitious statistical tables of madness.[400] While medical institutions of the 18th century had kept statistics, it was the opinion of James Prichard that France was very behind other countries in collecting statistics on mental illness.[401] Nonetheless, Esquirol moved statistical analysis to the centre of the debate over mental illness. Esquirol, a more pragmatic than philosophical physician, spearheaded the importance of statistics in the establishment of the journal

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397 J. Loudon & I. Loudon, 'Medicine, Politics, and the Medical Periodical', in W.F. Bynum, S. Lock, & R. Porter (eds)., *Medical Journals and Medical Knowledge: Historical Essays*, (London, 1992), p. 64.

398 L. Cartron, 'Degeneration and Alienism in early 19th century France', in S. Muller-Wille & H.-J. Rheinberger, *Heredity Produced* (London 2007), pp. 155-175, p. 161.

399 Ibid., p.165

400 C. Lopez-Beltran, 'In the cradle of heredity; French physicians and l'heredite naturelle in the early 19th century', *Journal of the History of Biology,* no. 37, 1 (2004), pp. 39-72, p. 47.

401 J. C. Prichard, A Treatise on Insanity and other disorders affecting the mind, (London 1835), p. 246

Annales d'Hygiene Publique et de Medecine Legal, and by the time of the publication of his collected essays in the form of a treatise in 1838, Esquirol's tables – and subsequently, his deductions as to the hereditary nature of madness – were commonly traded between periodicals and textbooks on madness in Britain and America.[402]

Jules Baillarger, the asylum, and 'facts so numerous'

Jules Baillarger enjoyed a far greater international reputation by 1845 than he did at the close of 1840. His histological work on the layered structure of cortex, carried out in that same year, had resonated throughout Europe and America.[403] While Baillarger's research interests would migrate towards hallucinations in his later years, after the completion of his thesis in 1837, Baillarger was dedicated to the vision of arriving at an understanding of the hereditary causes of madness via statistical analysis.

Historians have approached Baillarger from numerous points of departure. Edwin Clarke identifies Baillarger as a 'stalwart phrenologist' and attributes his interest in examining the layered structure of cortex to the phrenological school.[404] Jan Goldstein, meanwhile, regards Baillarger as one of the most significant members of Esquirol's circle that continued and furthered Esquirol's spiritualist commitments.[405] Most recently, Bernd Gausemeier, meanwhile, views Baillarger as one of many figures in France and Germany pioneering the idea that hereditary

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402 See, for example, their employment in: W.A.F. Browne, *What Asylums Were, Are, and Ought to Be* (Edinburgh, 1837). The statistics were also to be found in Prichard (1835), p. 72.

403 See, for instance, the review of his work in *The Phrenological Journal.* 'Dr Baillarger's Researches on the Structure of the Cortical Substance of the Cerebral Convolutions', *The Phrenological Journal,* no.14 (1841), pp. 63-65.

404 E. Clarke, *The Human Brain and Spinal Cord* (San Francisco, 1996), p. 425.

405 J. Goldstein, *Console and Classify,* (Cambridge 1987, pp. 262-264.

taint in families can be best understood via recourse to asylum statistics.[406] While Baillarger would leave Salpetriere soon after his appointment in 1840 to take up a position at Ivry, he would return to give the Salpetriere lectures in 1841, on the topic of statistical investigations of insanity. These lectures, first given by Esquirol in 1819, involved large audiences composed of students, peers, and visiting students and medical professionals from Britain. They took place within the asylum as their main purpose involved clinical exposition of actual patients, a point of contention and debate within Britain and America at the time.[407] The text, when published, would form a *precis* of the lecture, whose actual purpose was demonstration to students and visiting peers the pathological symptoms involved in the cases being treated.[408] He had such faith in the importance of hereditary factors in mental illness that he drew into question most, if not all, of the tables that had been produced on the question up to that point, owing to the failure of asylums to properly investigate family histories.[409] There were good reasons for this. Esquirol had observed that many of the female patients admitted to Salpetriere did not know the names of their parents, whereas wealthy patients admitted at Charenton were often unwilling to divulge their family histories.[410] Nevertheless Esquirol's practical difficulties in establishing the family histories of his patients did not distract from his faith in the significance of hereditary causes – the thirteen entries

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406 B. Gausemeier, 'Pedigrees of madness: the study of heredity in nineteenth and early twentieth century psychiatry', *History and Philosophy of the Life Sciences,* no.36, 4 (2015), pp. 467-483, p. 470.

407 J. Webster, 'Review: Observations on the admission of medical pupils to the wards of Bethlem', *The American Journal of the Medical Sciences,* no.9 (January 1843), p. 417.

408 Ibid., p. 417.

409 J. Baillarger, 'A Course of Lectures on Diseases of the Brain and Insanity. III.' *The Lancet,* 45, no.1118 (1845), pp. 493-497.

410 H.G. Stewart, 'On hereditary mental illness', *Journal of Mental Science,* 10 (1865), pp. 51-52.

for the *Dictionnaire* all prioritised the importance of heredity as a cause of madness.[411] Where Esquirol estimated at Ivry that 1 in 2.87 cases were hereditary, Baillarger believed the true number was closer to 3 out of 4.[412] But he saw a bright future nonetheless, where the difficulties in using the asylum to investigate family histories would be overcome. In his series of lectures he delivered at Salpetriere in 1841, he commented:

> researches of this nature, apart from the study of insanity, are interesting to physiology, and the history of hereditary diseases in general, as yet so little advanced. These researches must therefore, for the future, be persevered in; and lunatic asylums offer in this respect facts so numerous, that in the course of a few years we cannot avoid arriving at definite results.[413]

Asylum doctors were of significance to natural philosophers interested in how physical and mental characteristics are transmitted to offspring – indeed, Baillarger predicted that within the course of the decade, asylum doctors would, through statistical analysis, arrive at an understanding of heredity prior to any other fields. Essential to the vision of unlocking heredity was the role to be played by statistical analysis. John Thurnam, the surgeon at the Retreat at York, when correcting some of Esquirol's statistics in his widely read 1845 work on the statistics of insanity, opened the book with a passage from Humboldt: "In all that is fluctuating, changeable in space, mean numerical values are the ultimate object – they are the expression, indeed, of physical laws; they shew us the permanent in the change and in the flight of phenomena."[414] The idea that asylums were a place in which these

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411 C. Lopez-Beltran, 'In the cradle of heredity; French physicians and l'heredite naturelle in the early 19th century', *Journal of the History of Biology,* no. 37, 1 (2004), pp. 39-72, p. 47.

412 Baillarger (1845), pp. 493-497.

413 Baillarger (1845), p. 496.

414 Quoted in J. Thurnam, *Observations and Essays on the Statistics of Insanity* (London, 1845), p. 1.

mean numerical values could be obtained was one that asylum physicians were quick to tie to the question of heredity.

As I will conclude, even the asylum doctors most adamant to demonstrate hereditary taint struggled to put forward clear cases of evidence. But the idea that asylums were *the* place in which to uncover these families was one that, as I will show, already had support in Britain. Among the audience members at Baillarger's lecture was British obstetrician Robert Barnes, who would go on to publish some of the most clinical treatises on cervical tumours and obstetrics from the 1850s onwards. While a student at Salpetriere, Barnes' interests tended towards the relationship of the womb to insanity, commenting years later that it was from Baillarger that he learned that the first bout of insanity in a woman would almost always follow the close of her first menstrual cycle after labour (what we would now identify as post-partum depression).[415] While establishing his practice in London upon his return from France, Barnes undertook to translate Baillarger's lectures for publication in *The Lancet*. Barnes ensured that Baillarger enjoyed a wider audience in Britain and America through his translations – but Barnes was only one of numerous physicians in Britain that were importing, translating, and diffusing new ideas from France and Germany.

Encyclopaedias and popular textbooks that based their entries on 'insanity' and 'lunacy' after the work of Esquirol, and the idea that asylums were uniquely positioned to study family histories and arrive at an understanding of how mental

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[415] R. Barnes, *A System of Obstetric Medicine and Surgery* (London, 1884), p. 420. Barnes' Lumleian Lecture in 1873 on "The Convulsive Diseases of Women" has been discussed by Mary Wilson Carpenter as "ballooning" the myth that the removal of ovaries could be used to treat mental instability. See: M.W. Carpenter, *Health, Medicine and Society in Victorian England* (Oxford, 2010), p. 153.

illnesses were both acquired and transmitted was largely uniform in Britain by the time that Baillarger's words would reach a wider audience. However, what Baillarger really succeeds in promoting in his 1841 lectures is a series of specific questions about the nature of heredity that he believes asylums can answer, and it is the importance of one question in particular that I hope to address in this chapter: what, precisely, is transmitted? Baillarger regarded it as sufficient proof of hereditary mental illness if either parent suffered from *any* mental illness.[416] Chief among Baillarger's hopes was that statistical analysis would be able to show whether or not *any* family history of depression, madness, or aloofness, was sufficient to produce epilepsy in offspring (or vice-versa).[417] Baillarger asks: "A man dies epileptic; his son becomes insane. Is the insanity in this case hereditary?" Baillarger clearly anticipates that statistical analysis will bear out that the answer must be yes; but what theory of mind does Baillarger endorse that would deliver such an answer? An insight can be gathered by Baillarger's further query: he wants to know how many infants born to women in asylums, before or after their symptoms have emerged, have died of convulsions, seizures, and brain inflammation.[418] Baillarger, in other words, felt that statistical analysis would demonstrate that hereditary madness more often than not led to death before maturity.

In Britain, Baillarger's reputation for being a strong advocate of heredity nervous disorders on occasion preceded that of Esquirol – possibly so that the notion that madness was hereditary could be drawn under criticism without

416 Baillarger (1845), p. 495.
417 Ibid., pp. 110.
418 Ibid., pp. 111.

besmirching the name or reputation of Esquirol himself. An Edinburgh reviewer complained:

> Baillarger assumes it to be made out; for he says 'all agree about hereditary influence in the production of insanity.' There is scarcely a medical man in charge of a lunatic establishment, who has not a conviction of the hereditary transmission of insanity [...] Have we then any proof that when particular diseases exist in the parents [...] they will, during any period of life, be more frequently found in their offspring than in the offspring of persons not so affected? I know of no evidence bearing out that opinion.[419]

Pierre Paul Royer-Collard, in an article reprinted by the *Medico-Chirurgical Review*, cautioned that to compile tables on the question of heredity in mental illness was nearly hopeless; how could accidents, lesions, environmental causes, ever be sufficiently weighed against the fact that one's father had erratic ideas, or one's mother suffered hysteria?[420] But as the physician Hugh Grainger Stewart would observe in 1865, enthusiasm for diagnosing patients as suffering from hereditary illness never reached the same levels in Britain as it did in France.[421] While Moreau would declare in 1859 that 90% of mental illness is hereditary, Esquirol's number of 33% was more often repeated in Britain, if with certain caveats that the figure could be much larger.[422]

The Inheritance of Acquired Characteristics in *The Phrenological Journal*

When George Combe published his *Constitution of Man,* the *Journal* had already been running for some years. Nonetheless, the significance of the text to

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419 B. Philips, 'Scrofula: its nature, its causes, its prevalence, and the principles of treatment', *Edinburgh Medical and Surgical Journal,* no.66 (1846), pp. 183-4.

420 P.P. Royer-Collard, 'On the Statistics of Insanity', *Medico-Chirurgical Review,* 51 (Oct 1 1847), p. 538.

421 H.G. Stewart, 'On Hereditary Insanity', Jo*urnal of Mental Science,* no.10 (1865), p. 51-52.

422 Ibid., p. 49.

phrenology, to medicine, and to British society was tremendous, and it shaped the direction and content of the *Journal* in the years that followed its publication. Combe included in *The Constitution of Man* a compilation of cases gathered from around the world that supported the idea of the inheritance of acquired characteristics, although Jenkins maintains that Combe has no examples from the human realm of the inheritance of acquired characteristics.[423] Jenkins carefully delineates different ideas about heredity – the transmission of temporary states of the body, the transmission of ideas of the mother, and the transmission of acquired habits – that, while valid distinctions made by Combe, are all still varieties of the inheritance of acquired characteristics, and Combe's peers were rarely so careful in sorting out the different implications of such cases. In the following details I take a generous view of what kinds of cases and anecdotes counted as significant in the development of the idea. Bill Jenkins has analysed these cases and argued that they fit into a wider discourse in medicine and agriculture from which Combe borrowed. For Jenkins – and as well for Robert Richards – the Combe brothers' interest in the inheritance of acquired characteristics was a manifestation of their faith in the relationship between natural law and the promise of social progress.[424]

The Combe brothers also enjoyed a rocky relationship to religious authorities. Many phrenologists who contributed to *The Phrenological Journal,* both before and after 1828, regarded themselves as promoting a Christian science. While Combe had a profound break with the Christian phrenologists in 1828, Combe himself maintained, as Richards has noted, a theological explanation for nature's

423 Jenkins (2015), p. 470.
424 Jenkins (2015), pp. 468-469.

origin.[425] Still, the Combe brothers were never viewed as important allies by religious authorities by any means. On the publication of Andrew Combe's memoirs, a reviewer for *The Christian Reformer* commented:

> That he [Combe] abandoned Calvinistic theology is quite clear; but it does not appear that he adopted any form of Christian belief in its stead. We much regret that the real state of the case on this point is not made known to us; for we are often at a loss to understand the bearing of Dr. Combe's references to religion, from our ignorance of the exact religious position which he himself sustained.[426]

Rather than pursue the question of personal faith that the reviewer urges, I will (particularly in chapter 5) look instead to the significance that phrenological notions of heredity had for Christian institutions dedicated to temperance, and affirming the importance of leading a moral and temperate life.

The Phrenological Journal has never enjoyed much attention from historians of medicine, science, or phrenology. Still, it provides a crucial means of evaluating how these ideas about the inheritance of acquired characteristics permeated a non-professional readership. The historian David de Giustino had the first (and final) word on the significance of *The Phrenological Journal* in his 1975 work on phrenology. In that work, he describes a journal financed by George and Andrew Combe, along with several other editors, that begins with confidence but never succeeds in making a profit, and indeed only persists after 1829 because of the fears that its death would mark the death of phrenology.[427] De Giustino views Watson's editorialiship from 1837 as spearheading an effort to transform an overly-philosophical journal into one that was more polemical and aggressive in

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425 Richards (1987), p. 252.
426 'Dr Andrew Combe', *The Christian Reformer,* no.7 (January 1851), p. 70.
427 D. de Giustino, *Conquest of Mind* (London, 1975), pp. 80-81.

attacking the critics of phrenology.[428] The picture of a failed journal (and failed science) is still attached to the *Journal*, even when more recent historians such as Frank Egerton, John van Wyhe, and Bill Jenkins have sought to re-evaluate the fortunes of the science. Still, *The Phrenological Journal* represents a direct means of evaluating the proliferation and reception of Combe's views on the inheritance of acquired characteristics. It also was, for all of its flaws and shortcomings, an important scientific journal of its time. William Whewell, a staunch critic of phrenology, subscribed to the *Journal*.[429] Many asylum doctors and superintendents were phrenologists of one stripe or another in the early decades of the 19th century. Among its editors, Richard Poole was a well-known physician who had contributed to the *Encyclopaedia Britannica* and would later become superintendent of Montrose Asylum. The botanist Hewett Cottrell Watson's tenure as editor of *The Phrenological Journal* coincided with the publication of some of his most important botanical works. And Darwin, in his notebook *M* (kept during his visit to Edinburgh), recorded in 1838 that there were some tenets of phrenology that he found (almost) convincing. “Insanity and Epilepsy remain many generations in families,” he wrote, observing in the next line: “One is tempted to believe phrenologists are right about habitual exercise of the mind, altering form of head, & thus these qualities become heredetary [sic].”[430] *The Phrenological Journal* had a readership on par with the magazines produced by Loudon in the same era. A subscription of 500, with a readership estimated at 3,000, place it far behind *The*

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428 Ibid., p. 83.

429 See J. van Whye, *Phrenology and the Origins of Victorian Scientific Naturalism* (London 2004), p. 62.

430 Darwin, C. *Notebook M*. 1838. CUL-DAR 125/20, in J. van Whye (ed.), *The Complete Works of Charles Darwin Online,* stable URL: http://darwin-online.org.uk/), accessed July 21st 2017.

Lancet, but then its aim was always to establish a community that could share knowledge and methods within its pages.[431] To put these figures in perspective, *The Lancet* enjoyed a subscription of over 8,000 by 1828, and the readership would have been several times that figure by the 1840s.[432] *The Phrenological Journal* was small, but never ignored. Its contents mattered to both the critics and the proponents of phrenology.

From the first issue, one of the aims of *The Phrenological Journal* was to invite readers and Society members to contribute cases (and casts) that supported, in some way, phrenological methods and tenets. One key concern was to find and promote evidence of the *heritability* of the organs thus far identified within the practice of the science. One of the principal theses of the journal – expressed in the first issue – was the belief that as persons acquire and exercise habits, these strengthen the organs of thought, producing changes in the structure of the brain that were (for many phrenologists, but not all) transmittable to offspring. In an article titled "Mental Derangement and its Causes," the author maintained that insanity always indicates a peculiarity in the patient that is "The transmission of a hereditary tendency from parents to children." These peculiarities, the author says, are "either natural or acquired", but once so acquired, they taint the family forever.[433] That such acquired peculiarities were indeed transmitted to offspring was fact supported by evidence – the author appealed to cases familiar to the reader:

> The operation of hereditary tendencies is well exhibited in the families of parents who have become insane from accidental causes without any previous predisposition. The children born prior to the

431 L. Brake, & M. Demoor, *Dictionary of Nineteenth-century Journalism in Great Britain and Ireland,* (London, 2009), p. 496.

432 Ibid., p. 344.

433 'Mental Derangement and its Causes', *The Phrenological Journal,* 5 (1829), pp. 481-516, p. 505-6.

> existence of the disease in the parent remain as safe from its attack as those of parents who never have been affected; while those born subsequent to that time, and who may thus be supposed to have inherited the impaired constitution of their progenitor, are observed to be much more liable to its invasion than untainted children.[434]

While many doctors alluded to such cases, the number of anecdotes that were available to support them were noticeably absent from many essays on insanity and heredity produced in this period. Demand for proof was high, but the cases themselves were hard to produce. Despite the willingness of many contributors to repeat this view, two difficulties presented themselves. Firstly, although numerous writers stressed the importance of finding cases that presented clear evidence of the inheritance of acquired characteristics, they themselves were uncertain as to what they hoped to find. Secondly, most of the writers and editors acknowledged that there were obvious limitations to the idea that families would volunteer disparaging histories of themselves, and that the few documented cases of hereditary insanity must form the tip of an iceberg.

But were the cases accumulating in the pages of *The Phrenological Journal* supplying the kind of evidence that was desired? Efforts to improve the magazine always returned to this question – the validity of the evidence that was contributed – and while historical attention has often been critical of the anecdotes and cases that appeared in the journal, they were not different in kind from those that appeared in gardening or agricultural journals of the time. Watson's own time at the journal has been described by Egerton as one wherein the methodological goals of botany were brought to bear on improving phrenology:

> The phrenological investigations he envisioned were probably similar to the botanical investigations he was carrying out: a massive amount

434 Ibid., p. 507.

of data organized into as many meaningful correlations as possible, in the hope that significant conclusions would somehow emerge.[435]

Watson's Baconian approach was not, however, such a shift from the past. The desire to accumulate cases in this manner had been the aim of every editor in the past. Under Richard Poole's editorialship, *The Phrenological Journal* had worked to encourage its readers and contributors to furnish evidence and observations. Under a communication submitted by "A.Z.", regarding the simultaneous hanging of two criminal brothers in Gloucester, the editor commented "We shall be glad to receive from any of our correspondents a more detailed account of this family; and, if possible, a notice of their cerebral development."[436] No further details were furnished, but the demand for a legitimate account, for casts and measurements, was one that the editors of the *Journal* perpetuated throughout its twenty five years. And such details were, ideally, suppliable by the readers themselves. According to van Wyhe, "Phrenology was articulated from the very beginning as the premier short-cut science."[437] Part of its appeal lay in the (*prima facie*) clarity of its methods and insights, and the visibility of the evidence it rallied to support its depiction of the human condition. There *ought* to be a means of instilling in the readers the means of providing their own observations; and while only partly realized, this goal remained inextricably linked to the ways in which the understanding of the inheritance of acquired characteristics was articulated in the pages of the journal.

In some cases, the journal sent its own investigators to meet unusual cases.

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435 F. Egerton, *Hewett Cottrell Watson: Victorian Plant Ecologist And Evolutionist* (London, 2003), p. 59.

436 A.Z., 'On the Hereditary Tendency to Crime', The Phrenological Journal, 2 (1825), p. 467.

437 Van Wyhe (2004), p. 40.

A man in Scotland, who reported experiencing spectral visions and claimed that his son had inherited the peculiarity, received a visit from *The Phrenological Journal* in order to measure his head and verify his accounts. In addition to often perceiving visions of 'a carpet in motion', his son also experienced visions (this time of a beggar-man with whom he would speak). The man, “by no means liable to extravagance either in his sentiments or ideas,” was taken as an exemplary case both of the role of the organ of wonder in producing apparitions, and also of the transmission of these peculiarities from parent to offspring.[438] In February of 1828, Spurzheim visited Edinburgh's Children's Hospital, where he was (reportedly) able to identify the best and worst-behaved children by consideration of their heads. The children, interested in Spurzheim, were reported to be interested in his power, and Spurzheim “gathered them round him” and explained that the heads of the children whose parents “are in general of the very lowest ranks of life,” had lower heads.[439] In both cases, the hereditary question is answered first by the testimony of the individual, and legitimated by the investigating phrenologist. In this way, the inheritance of mental peculiarities from hallucinations to immoral behaviour became visible and observable to those trained to spot the signs. However, relying on the testimony of patients could also lead to controversy. Hewett Cottrell Watson fell into a public dispute with James Levison in 1843 when he appended a note to some cases submitted by Levison, where he called into question the veracity of testimony given by a patient that Levison himself admitted was 'unscrupulous.'[440] The editor explained “In the present position of phrenological science, zealously

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438 'Apparitions', The Phrenological Journal, 2 (1824), pp. 111-112.

439 'Dr Spurzheim's Visit to the City of Edinburgh Lunatic Asylum', *The Phrenological Journal,* 5 (1828), pp. 142-145.

440 See 'Our Querulous and Critical Correspondents', *The Phrenological Journal,* 13 (1840), pp. 16-18.

supported by many enthusiastic minds, but unfortunately not much cultivated by men accustomed to scientific research, – though many of them may give a tacit acquiescence, – accuracy in our reports of facts, and in our reasonings on those facts, is of the highest importance."[441] Levison published more cases in the *Journal* after Watson departed – but the problems were ones shared by the gardening and agricultural magazines of the era. The forms of evidence envisioned by the editors were often of a higher quality than the reality that they received.

Most of the medical cases submitted by readers neglected the question of heredity; the exception being Browne's extended essay on heredity, which ran across three issues. But this absence was filled by repeating or borrowing older cases from elsewhere. Cases of Spurzheim and Gall were repeated. In an article on "Acquisitiveness," the reader was drawn to the attention of "One of Gall's friends, a man of eminent talents", who became a religious fanatic. The corresponding organ was "strongly marked" in the father, and also in two of the children, who shared the tendency towards fanaticism.[442] Volume 3 published the research of William Atherton, who drew attention to an old communication to the Royal Society from 1779 where a "J. Scott", who could not recognise colours, explained: "It is a family failing – My father has exactly the same impediment: my mother and one of my sisters were perfect in all colours;--my other sister and myself alike imperfect. My last mentioned sister has two sons, both imperfect."[443] Colour blindness was a topic of continual interest in the *Journal*, but Atherton's question was over the hereditary nature of the condition. How had it arisen? "The family affected with this

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441 Ibid., pp. 19-20.

442 'Acquisitiveness', *The Phrenological Journal,* 2 (1824), p. 225

443 Quoted in W. Atherton, 'Power of Perceiving Colours', *The Phrenological Journal* 3 (1825), pp. 45-47

imperfection of sight must have had an imperfect organ of Colour," he wrote, speculating that accident or some other event could have affected the organ in the family's past.[444] Cases taken from asylum reports also helped to provide more evidence of how habits, acquired by parents and grandparents, could become hereditary in offspring. In a review of William Ellis' 1838 asylum report for Wakefield, the review provided a synopsis of the more interesting cases from the view of the phrenologist. Among them, "the case of a female is given, who had a strong inclination to suicide, and who eventually succeeded in carrying her wishes into effect, by hanging herself when unobserved: her mother and two of her sisters had hung themselves."[445] The idea that such hereditary taints were caused by some initial accident to an organ of the brain that became hereditary was often more difficult to ascertain; but the faith that the origin of these hereditary illnesses lie in some fault or accident of a family member back in the past was seldom called into question.

As evidence of this anxiety, the journal exercised regular calls for phrenological marriages and careful breeding. This stemmed in no small part from the ideas of Spurzheim, and the ease of drawing parallels to the world of livestock breeding:

> The importance attached to pedigree is in reality founded in a law of nature and hence also the value attached to it in the case of the lower animals, where each parent has been selected for his peculiar excellencies. [...] The age of the parents, their health, and especially that of the mother, and their state of mind, all exercise much influence on the destinies of their progeny."[446]

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444 Ibid., p. 47

445 'Ellis on Insanity', *The Phrenological Journal,* 11 (1838), pp. 414-420, p. 416.

446 'Spurzheim on Education', *The Phrenological Journal,* 1 (1823), p. 582.

In 1840, the editor Hewett Watson included a reprinted article from *The Lemington Spa Chronicle* that claimed to have observed that the offspring of retired race horses shared the weak, infirm legs that their sires had gained from years racing.[447] When John Sebright published his pamphlet on animal instincts in 1836, the *Journal* reviewed his opinions (translating his observations into phrenological terms). But Sebright's views on the importance of inheritance remained, and the review was keen to maintain that the inheritance of acquired habits was supported by evidence from nature:

> the state of domestication causes physical differences in the brains of ducks and other animals. The offspring usually represents its parent; and thus, in the common order of nature, these physical differences are transmitted by hereditary descent. The second generation consequently starts with an organic frame, including the brain, slightly different from that which is observed in the wild individuals.[448]

The animal and human case merged in the pages of the *Journal*. On the 9th of June 1828, a Dr Alexander read a paper to the society arguing that "qualities of mind" were transmittable to offspring; and that "Those marriages would bring posterity as near moral and intellectual perfection as man could attain, which were formed with due regard to the constitution of the parties, their health and temperament."[449] Alexander warned that very young couples had children with an excess of 'animal propensities' – the contrast to the popular view that children with elderly parents were prone to melancholy. Combe himself, in his lengthy review of Chalmer's *Bridgewater Treatise*, argued that scholars that neglected the health of the body

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447 'Hereditary Transmission of Disease,' *The Phrenological Journal,* 15/16, 1840, p. 191.

448 '[Review] John Sebright, Observations on the Instincts of Animals', *The Phrenological Journal,* 10 (1836), p. 378.

449 'Notices', *The Phrenological Journal,* 7 (1828), p.190; 'On Human Capability of Improvement', op.cit., p. 206.

could transmit feeble frames to their children.[450] The view of marriage and reproduction in the human case increased in scrutiny, adopting the same attitude towards the inheritance of peculiarities in human offspring as figures like Youatt encouraged in the animal realm.

The suspicion that the constitution of the mother at the time of conception could be transmitted to the child was also one that contributors to *The Phrenological Journal* encouraged. Citing the example of the criminal David Haggart, who had murdered a jailor at Dumfries, the author proposed that animalistic tendencies had been inherited from his mother. "The physical condition of the mother has a powerful influence on the bodily and mental constitution of the children," the author cautioned, "and on this account she ought to be taught the best means of invigorating and preserving her own health."[451] Such speculative cases might have driven editors to leave the journal, but they also contributed to a culture of observations of peculiarities in families which reached to the highest levels of medical and scientific activity. In a later issue, a contributor related a case where an unmarried woman and soldier, who conceived a child while drunk, gave birth to an idiot whose mental capabilities mirrored those of the mother at the time of conception.[452] The insistence that even such *temporary* alterations to the constitution were transmitted was one that found frequent voice within the pages of the journal. In an article on improving the race found in the same issue, the reviewer commented on the principle of the inheritance of such changes to the constitution that: "This is a truism familiar to everyone, and is uniformly and

450 A. Combe, 'On the Power, Wisdom, and Goodness of God', *The Phrenological Review,* 8 (1833), p. 362.
451 'Woman in her social and domestic character', *The Phrenological Journal,* 7 (1829), p. 411.
452 'On the application of phrenology', *The Phrenological Journal,* 8 (1833), p. 472.

successfully acted on, in the breeding of inferior animals. That all constitutional qualities are transmitted from parents to their children, admits of not a doubt."[453]

As Egerton has noted, readers and eminent phrenologists alike wanted more cases. Egerton has found that: "Dr Elliotson suggested that *The Phrenological Journal* should publish more case histories, and Watson wrote to George Combe (20 November 1837) that he agreed they were needed."[454] Some doctors did submit hereditary cases of madness. Henry Norrington, who communicated to *The Lancet* as well as *The Phrenological Journal,* wrote a communication on the "Case of a family in which every alternate child was born an idiot."[455] Norrington gave a full, detailed account of the condition of the family, dwelling on their particular ailments, and then turned to the task of diagnosing the cause. Through investigating the family, he learned that intemperance was part of their past, and put this forward as the cause: "The grandfather, I believe, was given to intoxication. The father is industrious and successful, and this, I presume, will prove that he is not an habitual drunkard. But he is, unquestionably, a great drinker of cider."[456] As I will discuss in chapter 5, the widespread conviction that alcohol not only impaired the mental constitution of the drinker, but that this impairment was transmitted to their children, was not only put forward by later figures as evidence of the inheritance of acquired characteristics, but it also became one of the means by which doctors attempted to uncover cases where children born before the onset

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453 'Caldwell on the improvement of man', *The Phrenological Journal* 8 (1833), p. 616.
454 Egerton (2003), p. 58.
455 H. Norrington, 'Case of a family in which every alternate child was born an idiot', *The Phrenological Journal,* 15 (1842), pp. 160-161. For Norrington's contributions to *The Lancet,* see H. Norrington, 'Remarks on the Plague in Reply to Dr. Bowring', *The Lancet,* 31, no.802 (1839) pp. 575-578.
456 Norrington (1842), p.161.

of a mental disease (in this case, the disease of intemperance itself) were free from hereditary taint. Levison, who resumed submitting cases after the departure of Watson, submitted a case of hysteria, where a young woman became convulsive and mute after touching the cold skin of her dead father. This was merely the inciting cause of her condition; Levison suspected that a hereditary susceptibility could be traced, owing to the health of the father. While the mother was healthy, the father had been born with curvature of the spine, and was given to emotional outbursts.[457] Such tenuous connections were, for many doctors (including Browne), convincing evidence of hereditary madness. Dr Mackenzie submitted a case where a young woman suffered from hysterical episodes whenever she encountered mice – even toy mice and deceased ones on the side of the road. Mackenzie used the case as evidence that morbid affections can result in hereditary conditions, as her mother also suffered a fear of mice.[458] These hereditary fears were no different in principle from the instincts that Sebright and other agriculturists believed to have been made hereditary in domesticated animals.

The Phrenological Journal provides some context for the interest that asylum doctors took during this period in family history: it also helps us to understand the audience that W.A.F. Browne had in mind when compiling his own cases for the *Journal* (these are considered separately below). The idea that family histories were evidence of the workings of a natural law that could be uncovered by the accumulation of cases, and the idea that subjects could help elucidate this law by virtue of their own testimony, were powerful influences upon asylum doctors that

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457 J. L. Levison 'Case of Hysteria, with Loss of Verbal Language', *The Phrenological Journal,* 16 (1843), pp. 251-254.

458 G.S. Mackenzie, 'On Antipathies', *The Phrenological Journal,* 11 (1833), p. 113.

maintained some interest or commitment to phrenology.

Patient Testimony

Baillarger advocated statistics; but phrenologists tended to prefer a richly-detailed case study, and while lip-service was paid to the promise of statistical investigations, the most common form of evidence presented was that of a patient or family, rather than a statistical abstraction from an asylum report. This preference was not limited to phrenological investigations: through figures like Thomas Laycock, it was also part of an effort within medical training to give pride of place to patient testimony. Thomas Laycock, who maintained his own phrenological commitments in the 1840s, began his tenure at York with a lecture on everything that he hoped to see in a medical student. He chose clinical observation as his topic of choice – and in doing so, communicated his feelings about the rising stars of physiology that had eschewed medical practice.[459] "It is obvious enough that a physiologist *and nothing else* cannot be a good physician; but a practitioner may be a physiologist and *something more."*[460] For Laycock, medical authority must rest upon the experience of the practitioner. He had a Baconian understanding of how medical understanding ought progress: the greater care practitioners took to observe and write about their patients, the faster understanding of disease could progress. He preferred careful case studies to statistical abstraction. His reaction to the statistical approach of John Thurnam, was polite, but he departed from the view that statistical analysis was the route by which disease could best be

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459 For a discussion of Thomas Laycock's commitment to phrenology, see F. James, *The Life and Work of Thomas Laycock, 1812-1876,* (unpublished dissertation, University College London, 1995). M. Barfoot, 'David Skae: Resident Asylum Physician', *Medical History,* 53, no.4. (October 2009), pp. 469-488.

460 T. Laycock, 'A lecture on clinical observation', *The London Medical Gazette* no.15 (July 1846), pp. 141-148, p. 141.

understood.[461] "All who are familiar with statistical inquiries," he wrote in the *British and Foreign*, "are aware of the fallacious results of calculations deduced from limited series of facts and short periods of observation."[462] He does not necessarily accuse Thurnam of falling prey to this evil – but statistical abstraction was, for Laycock, a step removed from the heart of the matter. Like Browne, Laycock was both deeply interested in the hereditary nature of mental illness and suspicious that statistical analysis was the best means by which to investigate it.

Laycock was interested in how the practitioner should approach the patient, and wrote on different methods of approach open to the medical student. He discussed methods that involved beginning with textbooks, or limiting the information gathered from the patient by targeted questioning – but Laycock preferred a different approach. To quote: "there is another, in which you let the patient himself describe his *status praesens*, and his *anamnesis*, and you only make such inquiries and explorations as are necessary to perfect your knowledge of the case. This method I prefer."[463] His student, the neurologist John Hughlings Jackson, would continue this approach. His profoundly careful work at recording the speech impairments of his patients comes from just such an ethos: even his most philosophical papers are built upon dozens of case studies, and those case studies are, in turn, the product of his methods of clinical observation. "let me urge students, who wish to make cases things to think from, to avoid the too free use of technicalities and to study one case by the light of many."[464]

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[461] T. Laycock, 'Dr Thurnam on the Statistics of Insanity', *The British and Foreign Medical Review,* no.2 (October 1846), pp. 349-366. [attributed to Laycock by James (1995)].

[462] Ibid., p. 351.

[463] T. Laycock, 'A lecture on clinical observation', *The London Medical Gazette* no.15 (July 1846), pp. 141-148

[464] J. H. Jackson, 'Notes on the Physiology and Pathology of Language', *Medical Times and Gazette*.

'So much for the accuracy of certificates!' The improbabilities of a science of heredity in the asylum

The demand for evidence by publications like *The Phrenological Journal* has been set out; so too has an institutional interest in patient testimony. How, in practice, was this culture put to practice within an asylum? Baillarger's vision must have seemed at the least a little preposterous to practicing asylum doctors. The scant information contained on medical certificates, combined with deep confusion over how to weigh patient testimony and information about family history conspired to produce asylum case books that speak more to frustration and confusion than they do to clear indications of hereditary insanity amongst the patient body. Asylum records provide us with an opportunity to view how ideas about heredity and illness evolved in practice, before they were expressed in periodicals and magazines by asylum doctors that aspired to increase their reputation and authority. Of the numerous asylums in Britain that could have afforded an example, Camberwell Asylum provides an ideal case because its superintendent, John Hayball Paul, was both interested in cases of hereditary insanity that fell under his treatment but also uninterested (or unsuccessful) in publishing his views. Paul's interest in phrenology has already been noted by other historians, particularly as Paul's case notes describe an interest in eye colour and in skull shapes that evidence an effort to apply phrenological diagnostics to his patients.[465] The asylum offers an opportunity to observe how Paul applied the ideas about hereditary insanity during his time to diagnosing and managing his patients, and the unique struggles and pitfalls that he

(June 22, 1866) p. 662.

[465] See H. Goodman, 'Madness and Masculinity': Male Patients in London Asylums in the Victorian Period', in S. Trowbridge & K. Knowles (eds), *Insanity and the Lunatic Asylum in the Nineteenth Century,* (2015), pp. 149-167, p. 165.

faced in trying to learn enough about his patients to understand the causes of their illnesses.

Paul, the first surgeon at Camberwell pauper asylum in London, faced tremendous challenges in trying to prioritise the importance of hereditary factors in diagnosing and treating his patients, and while looking at his recorded cases demonstrates just how far the practical conditions at a pauper asylum stood in the way of the kind of research that Baillarger envisioned, Paul's own observations and actions as a physician demonstrate that the practical understanding of heredity that he enlisted at Camberwell was remarkably similar to that of Browne's. We have no published papers of Paul's, but some sense of his travels and qualifications can be gleaned. He became a licensed apothecary in 1845,[466] and was awarded his MD by the University of St Andrews in 1854. He was admitted to Royal College of Physicians in 1859, and would later become treasurer of the Medico-Psychological Association, to whom he entrusted the case books from Camberwell Asylum that he had kept.[467] One of the few memories kept alive of Hayball Paul was that he received a silver bowl from the Association on his retirement – few other achievements or other notices are attached to his memory. There is no suggestion that Paul was survived by any children, as on his death he left an estate worth 138,079 pounds, consisting of property in Scotland and the Isle of Wight.[468]

Camberwell Asylum was initially licensed in 1845-6 to accommodate 162 patients. The last of the large London pauper asylums, Camberwell was quickly filled with transfers from overcrowded asylums elsewhere, often with little or no

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466 See notices in *The Lancet,* (May 12, 1845), p. 666.
467 See notices in *The Lancet,* (November 26 1859), p. 89.
468 See notices in *Economist, (*February 1899), p. 500.

accompanying information as to the history of the patients – a source of profound frustration on the part of Paul.[469] As attested to by Paul's casebooks and by external comment by the Lunacy Commission visitors, the asylum admitted an unusually high number of patients in very poor health or grave condition.[470] It was common for Camberwell to receive paupers for whom there was no room at other asylums, such as Leicester.[471] The asylum had extensive grounds. Paul was its first surgeon.

Out of the 332 patients admitted in the year of 1846, Paul only ventured to record potential causes for roughly 70.[472] Of these 70, 34 were hereditary or congenital, and only 10 were marked as clearly arising from intemperance – surprising for a pauper asylum. 20 cases Paul linked to moral causes, citing poverty, grief, domestic disputes, and love. 3 cases he linked to uterine or puerperal insanity. Only a handful of cases out of the many sufferers of mania did he think were in fact *caused* by the consumption of religious or political media. In a private case Paul regarded the cause of mania to be over-study, and in another case Paul cited the exciting cause to be a fireworks display.[473] Out of roughly 260 patients that Paul does not list any predisposing or exciting cause, in only two of these cases does he rule out the possibility of hereditary taint.[474] Camberwell remained largely a

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469 N. Hervey, 'A Slavish Bowing Down: the Lunacy Commission and the Psychiatric Profession 1841-1860', in W. Bynum, R. Porter, M. Shepherd, (eds), Anatomy of Madness: Institutions and Society. Volume 2. (London, Routledge) 1985, pp. 101-120, p. 114.

470 Lunacy Commission, Further Report of the Commissioners in Lunacy, to the Lord Chancellor, (London, 1847), p. 12.

471 See the discussion of Leicester Asylum in P. Bartlett, The Poor Law of Lunacy (London, 1999), pp. 122-124.

472 Paul uses a framework of predisposing and exciting causes, following Prichard's model of understanding insanity as necessitating a weakened nervous constitution. However, he often demurs to speculate as to either cause, recording simply that he has no further information of the patient's history.

473 See Camberwell Case Book 1846, Camberwell Asylum House Archives (held at the Wellcome Trust) hereafter: RCPPSYCH/X1/001/58.

474 These cases are John Jasper Borham, a pauper patient aged 48 suffering from acute mania (RCPPSYCH/X1/144) and Emily Kennedy, a 19 year old pauper patient admitted after falling into

mystery to Paul. He records the testimony of friends and family of his patients wherever it sheds light upon the patients, but for the most part the picture presented by his notes is that his patients are unmarried, friendless, and without family. The asylum presented little opportunity for the kind of grand laboratory that Baillarger envisions.

Paul was clearly challenged in diagnosing his patients by the position that Camberwell held in relation to other asylums in 1846. Many of the patients admitted to Camberwell came from Leicester, Bethlem and other institutions. Such cases arrived with no attached family history or explanation of the original cause of insanity.[475] Paul was also deeply frustrated with the certificate system, which he regarded as both inadequate and often misleading in understanding a patient's condition. Abraham Hodge, a 44 year old fisherman was admitted on the 10th of September for what appears to have been general paralysis related to the final stages of syphilis. Hodge's certificate cited acute mania, and claimed that the patient was violent and incoherent, and that the attack of insanity had first arisen only a few weeks' before his admission. However, Hodge had visitors, and Paul made a habit of communicating with any friends and family to try and learn more of the patients' history. He writes in the case of Hodge:

> Of his previous history I obtained the following information from his friends who have been to see him they state that he has been a very free liver and that he had a stroke of paralysis many years ago which was repeated about 12 months' since from which time he had been of

a state of mania after witnessing a violent thunderstorm (RCPPSYCH/X1/316). In the first case Paul notes that the record of Borham indicates that there is no family history of insanity, and in the case of Kennedy Paul cites the testimony of the girl's mother.

475 RCPPSYCH/X1/155 "He was sent to us from Severalls but without any information of his previous history."

unsound mind; so much for the accuracy of certificates![476]

Paul's preferred sources of information on patient and family history were friends and relatives; he seldom if ever records a case as hereditary based on the patient's own testimony. Exceptions to this usually include patients of greater means. In the case of Ann Thompson, the wife of a solicitor who was admitted for chronic mania, Paul gives the patient's own testament of her family history more weight, writing in her notes: "I have no history of her previous habits but she states that her aunt had been confined many years ago for some previous complaint."[477] Thompson is noted to suffer from paranoid delusions; she believes that there is a Catholic plot against her, but she is one of the only cases of acute mania whose own attested family history is recorded.

Where Paul did succeed in identifying a case as hereditary, we find that Paul, following Baillarger, Prichard, and Browne, regarded instances where family members suffered different forms of mental illness than the patient as still cases of hereditary insanity. Perhaps the most prominent case of such a kind came on the 19th of October, when a mother and daughter, Maria and Sarah Hopkins, were admitted to Camberwell. Both registered as paupers, Maria Hopkins had been a lace maker, and her daughter a plaiter. Maria Hopkins is described as suffering from melancholia, 'with various illusions.' Paul writes: "[she has] various illusions imagining that she has committed [graver] sins than anybody living, and says that she once attempted to murder her child and afterwards destroy herself."[478] Paul notes that the only information he has of her previous habits is that she has been

476 RCPPSYCH/X1/272.
477 RCPPSYCH/X1/13.
478 RCPPSYCH/X1/291.

previously confined at Bethlem Asylum.[479] Her daughter, however, is an epileptic prone to fits of violence. Despite the different conditions, Paul writes: "The cause of her malady was hereditary predisposition as her mother is an inmate of this asylum."[480] The case notes record that while the mother remains industrious and good-natured, the daughter has increasingly frequent fits, eventually dying during an epileptic fit in the winter of 1850, shortly after which her mother was discharged on order of the governors of the asylum.[481] Unlike other cases where Paul describes a case as hereditary without knowing the reasons why a family member or parent was committed to an asylum, here Paul himself is able to observe the very different maladies affecting mother and daughter, and yet the case of Sarah Hopkins is one of the more clear examples of hereditary insanity given his diagnosis.

The case of Maria and Sarah Hopkins is by no means the only incidence in 1846 where Paul diagnoses a case as hereditary where the parent or family member suffers a different form of mental illness than the patient. On the 16th of October, Camberwell admitted a pauper named George Clarke, a former printer who suffered from "various illusions on religious and other subjects."[482] Paul makes no mention of Clarke suffering from suicidal tendencies in the case notes, but affirms that "The predisposing cause of his malady was hereditary predisposition, his father having committed self-destruction."[483] In the 1840s, it was still a topic of strong dispute whether or not suicide cases counted as instances of insanity – but

479 RCPPSYCH/X1/291.
480 RCPPSYCH/X1/292.
481 RCPPSYCH/X1/291-2.
482 RCPPSYCH/X1/283.
483 RCPPSYCH/X1/283.

not only does Paul affirm that suicidal individuals are insane, but that the offspring of a suicide could find that the hereditary taint expresses itself in the form of chronic mania. But we can extrapolate more from the case notes – not only was Paul interested in the relationship of the dimensions of the skull to the manner of illness afflicting the patient, but he was also of the opinion that hereditary constitutions could give rise to a variety of different mental illnesses.

W.A.F. Browne and the inheritance of acquired characteristics

Of all the contributors to *The Phrenological Journal*, Browne was the most concerned to supply cases where the inheritance of acquired characteristics could be demonstrated. One of the first historiographical studies of W.A.F. Browne was Andrew Scull's comparative study of Browne and his contemporary John Connolly. Scull observed in that piece that Browne came from a family with no ties to the medical world, he was poor, struggled to find patients and only came into his position at Montrose Asylum through his personal connection to the Combe brothers.[484] Other historians have also worked to draw attention to Browne's phrenological ties. For Michael Finn, Browne is a phrenologist first, and a physician second.[485] Browne placed his faith in the phrenological community for his entire career, and like other phrenologist doctors he seemed to view his patients as being all potential case studies of interest to the science. Through his pamphlets and contributions to *The Phrenological Journal*, Browne would promote his own religious and philosophical commitments (or lack thereof) through the evidence provided by his patients, and in doing so he paid special attention to the

[484] See A. Scull, *The Asylum as Utopia* (London, 1991), p. xiii.
[485] M.A. Finn, *The West Riding Lunatic Asylum and the making of the modern brain sciences in the nineteenth century,* (PhD dissertation, University of Leeds, 2012).

inheritance of acquired characteristics.

Like Baillarger, Browne thought that an intemperate mother might give birth to epileptics, monomaniacs, or idiots – and yet he still viewed the mental disease suffered by the offspring as hereditary. “It is highly probable,” he wrote, “that the whole of the nervous system sympathizes, under such circumstances, in the disturbance of a part, and that, as a consequence of the morbid intensity of the functions of the base of the brain, great injury is done to the other portions of that organ, and a condition induced which is handed down, and consigns, or may consign, the next generation to the madhouse.”[486] Writing on the subject of heredity and insanity in 1841, Browne commented: “the recognition of such a law is not confined to men of science. It is universal – it is part of the traditionary knowledge of the vulgar, and is one of those truths developed by the experience of the ages.”[487] What such a claim conceals is that there was by no means universal agreement amongst physicians in asylums that hereditary causes were significant or even relevant to the scientific treatment of insanity. Browne's successor at Montrose Asylum, Richard Poole, was opposed to the importance of heredity based on his religious and philosophical commitments, and he made some artful public attacks towards Browne after taking over his casebook, noting that Browne had confined 75% of his cases as incurable, and that 4 of the cases Browne had listed as improving in his final year all proved terminal within months of his departure.[488] And as my consideration of *The Phrenological Journal* has shown, doctors and phrenologists alike were only partly successful in bringing forth evidence for the

486 W.A.F. Browne, 'Hereditary Tendency to Insanity', *The Phrenological Journal,* 14 (1841), pp. 16.

487 Ibid., p. 2.

488 R. Poole, *Memoranda Regarding the Royal Lunatic Asylum, Infirmary and Dispensary of Montrose* (London, 1841), pp. 21-25.

idea from their patients and their connections.

Patient testimony played a large role in Browne's writing, and also his views of treatment. Browne, as a phrenologist, was greatly interested in pressing his patients and interviewing them about their lives – indeed, his career as a published phrenologist depended upon uncovering cases. An example can be taken from a case study in 1839, where Browne considered the problems of allowing students to attend to conversations with patients. A case labeled C.C., Browne first met as a patient in 1835, when (with his medical students observing) the man refused to own the symptoms that Browne predicted, given the injury quite close to the faculty of Hope and Veneration. Browne writes "I did not again see C.C. as a patient until the autumn of 1837, when he applied at the Dispensary for advice. He requested a private interview with me; and when my pupils were removed, he confessed, with the most dejected and humiliated aspect, that he had formerly deceived me as to the state of his mind."[489] The lesson for his readers is that diagnosis must prioritise the knowledge of the patient, and that the relationship of physician to patient must be established before many of the most salient details as to the patient's condition can emerge. The context of uncovering cases that support and agree with phrenology motivated Browne to pursue this approach.

In his publications, Browne was not always clear on his sources of information. He reports a patient who was 'furiously and irrecoverably mad', whose father, judged sane by his friends, was given to delirium and cruelty.[490] The case was put forward by Browne as evidence of hereditary insanity. The mother was

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489 W.A.F. Browne, 'Affection of the Sentiment of Hope in consequence of an Injury of the Brain', *The Phrenological Journal,* 12 (1839), p. 158.

490 Browne, W.A.F. "Hereditary Tendency to Insanity." *The Phrenological Journal*. 14 (1841), p. 316.

deceased: had Browne learned of the father's true habits from the patient? He didn't elaborate, but Levison had also advanced patient testimony that would have appeared equally questionable by his peers. “The original development of the taint is occasionally obscure,” Browne claimed.[491] “The offspring of those who have exhausted their moral and physical powers by excess are born tainted.”[492] For Browne, knowledge that the origin of the taint lay in some ancestor's life was near-certain; whether the father, or some earlier figure in the family had injured the line was difficult to ascertain. Browne had been particularly struck by a communication from the phrenologist Richard Cull, who documented a family where a progressive improvement in the musical talents could be observed. The grandfather was untrained but played flute in a regiment band. The father was a good musician who played violin and pianoforte; and the granddaughter a musical prodigy.[493] Browne believed Walker's discussions of inherited instincts in Native American children that were raised by white settlers yet excelled at tracking and hunting.[494] Always invested in drawing from as many potential sources as possible, he cited the family of the MP John Elwes, who died in 1789. Browne views Elwes' “incontrollable, diseased propensity to *hoard*,” as having been inherited from the penurious habits of his mother.[495]

While espousing statistical methods in his 1837 *Lectures*, Browne contributed little to statistical analysis – he preferred case studies, and warmed to

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491 Ibid., p. 225.
492 Ibid., p. 225.
493 R. Cull, 'A Case of Precocious Musical Talent in the History of 'The Infant Sappho', Louisa Vinning', *The Phrenological Journal,* 14 (1841), pp. 24-30.
494 Browne (1841), p. 226.
495 Browne (1841), p. 315.

their narrative qualities.[496] He drew from historical examples, legal cases, and his own patients in choosing exemplary cases that underlined his own theories about the nature of heredity. In 1831, while returned from his time in France, Browne presented two cases he translated from Magendie.[497] These were to be his first efforts to establish himself as an authority on cases of mental disease that were pertinent to phrenology, an approach that he would maintain until he had settled into his appointment at Crichton. Browne was particularly invested in regularly contributing cases and papers to *The Edinburgh Ethical Society for the Study and Practical Application of Phrenology*. Browne became such a regular authority on patients as evidence of the tenets of phrenology, that the magazine would invite him to interview and examine patients that were not his own, but had been discussed by other physicians in different periodicals.[498] As Maureen Park has documented, he was one of the earliest collectors of patient art – another means by which Browne, like Laycock, had a wide view of the utility of patient testimony.[499] Browne appears in the 1837 lectures as an agent of reform, anti-restraint, promoting the inherent therapy of voluntary manual work and hygienic surroundings. In fact, we know from Michael Finn's work on Browne that he relied heavily upon opiates and other stimulants in treating his patients, an approach that Browne's son, James

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496 See Finn (2012). Finn has observed that Browne did not contribute any novel statistical analysis to his own *Lectures* at Montrose. His contributions to the *Phrenological Journal* both before and after the 1837 *Lectures* never appealed to statistical facts that Browne had derived from his tenure at either Montrose or Crichton Royal Asylum in the manner as, say, his peer John Thurnam, the surgeon (and phrenologist) at the Retreat at York.

497 'Proceedings of the Phrenological Society', *The Phrenological Journal,* no.7 (1831), p. 188.

498 'Derangement of the faculty of language—The case of Janet Whyte', *The Phrenological Journal* 10 (1837) p. 118. Browne was accompanied by Watson on this visit.

499 M. Park, *Art in Madness: Dr. W.A.F. Browne's Collection of Patient Art at Crichton Royal Institution, Dumfries, (*Dumfries, 2010).

Crichton-Browne, would also take.[500] Despite his reforms, restraints were still used during Browne's tenure at Montrose whenever patients took walks in the gardens, in order to prevent escape.[501]

Browne, like other asylum physicians discussed in this chapter, occasionally treated whole families, and took a keen interest in them. We know from the dispensary reports from Montrose Asylum that family members were so frequently admitted to Montrose that the frequency of the surnames led to confusion in accounting.[502] Browne was particularly impressed by a family under his treatment while stationed at Dumfries asylum, very shortly after his departure from Montrose. To quote the case:

> There are under my charge at this moment a father and daughter who are both insane, but whose morbid feelings and delusions are in no respect assimilated. The father lives in constant fear of death, and has taken his last meal, according to his own account, three times a day for the last two years; the daughter is a merry, garrulous, incoherent maniac; a younger daughter was formerly insane, and laboured under religious dependency.[503]

Such cases show that it was not just the case that it was theoretically expedient to think about heredity in the terms advocated by Baillarger; indeed, the incidence of family members with different mental illnesses in asylums in no doubt demanded that understanding change. Certainly, like produced like, and Browne affirmed that in the case of intemperance, "Such parents, it is affirmed, give a weak and lax constitution to their children [...] predisposed by their very organization to have

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500 Finn (2012), pp. 23-25.

501 "Thirteen of those here are paupers, and five of the men wear fetters, on account of the incomplete fencing of the garden." Poole (1841), p.30 (appendix).

502 Poole (1841), p. 128.

503 Browne (1841), p. 14.

cravings for alcoholic stimulants."[504] However, the idea that intemperate lifestyle on the part of the parent could transmit a weakened nervous constitution that would take form in new mental illnesses, unknown in the parent, was one that Browne felt exhibited in his own patients:

> Some time ago, I was called upon to treat a remarkably fine boy about sixteen years old, among whose relations no case of derangement could be pointed out, and for whose sudden malady no cause could be assigned except puberty and a single glass of spirits. His father, however, had been a confirmed drunkard, was subject to delirium and depression following inebriety, and died of delirium tremens. The boy recovered. His case presented many points of interest. His head increased rapidly, and the two hemispheres were of unequal size. The disease was intermittent; the patient passing a week in furious incoherent madness, and the succeeding week in perfect tranquillity and consciousness. These states were separated or connected by a short and profound sleep.[505]

Again, the father's symptoms: delirium and depression, are of a different classification than those ascribed to the son. Alcohol seems to trigger the mental illness, but inebriation bears no relationship to how and when he switches from a state of fury to one of calm. Why do such cases count as being 'hereditary' at all? One clue is in the reference to the difference in size between the two hemispheres. Like many others in 1838, W.A.F. Browne was paying close study to Alexander Walker's popular treatise *Intermarriage*. Walker's suggestion – in keeping with the tenets of phrenology – that the brain of the offspring was structurally patterned on one half after the father, and the second half after the mother, held appeal to Browne.[506] Walker believed that constitutions, not individual characteristics, are inherited – but constitutions were still related to behaviours and specific illnesses.

504 Browne (1841), p. 43.
505 Browne (1841), p. 8.
506 Browne (1841), pp. 7-8.

[507] Browne was intrigued by Walker's argument that the brain, in both crosses and inbreeding, owed one half of its structure to paternal influence, and one half to maternal influence – he cited Walker as an authority on the question, and the idea blended nicely with Esquirol's belief that males passed insanity to sons, and mothers passed insanity to daughters.

Case of Edward Oxford

Of particular interest to Browne was the case of Edward Oxford, treated by his friend Connolly. Notorious crimes offered windows of opportunity to phrenologists that they were eager to act upon. On June 10th, 1840, public waiter Edward Oxford fired what appears to have been a blank round at Queen Victoria and Prince Albert, whereupon he immediately surrendered to the authorities. Oxford's attempt at regicide has been discussed at length in current historiography, as it was at the time – he was put on trial for treason, and the public expressed great shock and dismay that Oxford was found not guilty by reason of insanity.[508] John Connolly, physician at Hanwell Asylum, examined Oxford and testified that he lacked the powers of reason to comprehend the nature of his act. He was ruled insane, and after some years in an asylum in Britain, sent to Australia. What was of most interest to the medical profession, however, was the argument that Edward Oxford was determined by the court to be insane by the principle of heredity. Oxford's grandfather, as was commonly discussed in the press, was intemperate, and had

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507 R.S. Cowan, 'Francis Galton's Contribution to Genetics', *Journal of the History of Biology* 5, no. 2 (1972), pp. 389–412.

508 See David Jones recent account of the Oxford trial in: D. Jones, *Disordered Personalities* (London, Routledge), 2015, pp. 67-71. Andrew Scull treats on the case in his discussion of the physician John Connolly. See: A. Scull, 'A brilliant career? John Connolly and Victorian Psychiatry', *Victorian Studies,* no.27, 2 (1984), p. 203. There is an extensive biographical treatment of young Oxford in P.T. Murphy, *Shooting Victoria,* (London 2012).

suffered a blow on the head that his widow thought worsened his violent episodes.[509] The grandfather of the regicide suffered from violent mania brought on by physical causes – the abuse of spirits and a physical injury. He was briefly institutionalised in his life. The father of the regicide was argued to be insane due to violent mania, but as he had never been committed to an asylum, more stress was placed on his attempts at suicide. The son, Edward Oxford, however, was neither suicidal nor violent. He was described as morally insane by physician John Connolly, and as an imbecile by W.A.F. Browne.[510] Both the popular press and the medical press seem largely at ease with saying that Edward Oxford was insane due to hereditary causes even though, from the viewpoint of classification, his own mental illness bore no similarity to that of his father or grandfather. Edward Oxford was not given to violent outbursts. He was not intemperate. He was judged by his former employers and peers to be 'different' and not like other boys as a youth[511], but his behaviour and habits were never likened to those exhibited by his grandfather and father. Here was a case where Oxford's own insanity was hereditary, but took an expression and form different from that of his father's or grandfather's.

A cast of Edward Oxford's head was taken the morning before his trial by Dr. Moore, and communicated to the Phrenological Society in Edinburgh. Combe thought the skull small, and thought that Self-Esteem and Love of Approbation were enlarged.[512] The Society approved heartily of the verdict of insanity, and

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509 See 'Remarkable Trials: Case of Oxford, for High Treason', *The Legal Observer,* no.21 (November-April 1841), pp. 68-72. See also: 'The Metropolis: The Trial of Edward Oxford', *the Spectator,* no.13 (1840), pp. 653-658.

510 See Jones (2015) for his discussion of Connolly's argument that Oxford was morally insane.

511 'The Metropolis: The Trial of Edward Oxford', *The Spectator,* no.13 (1840), pp. 653-658, p. 655.

512 'A cast of the *Head of Edward Oxford'*, *The Phrenological Journal,* 13-14 (1840), pp. 40-41.

Combe (at the meeting) drew connections between Oxford's low intelligence and desire for approval. The case of Edward Oxford tells us something about how both laypersons and physicians viewed the (pathological) inheritance of acquired characteristics in the 1840s: namely, that it was by no means as simple as that habits or behaviours adopted by the parent would find themselves hardened into tendencies or instincts in the offspring. Connolly would later reference it in his lectures, using Oxford as an example as to how the constitution of the mother at the time of pregnancy can be transmitted to offspring.[513] For W.A.F. Browne, the case became one of his key points of evidence that the abuse of spirits could cause a hereditary tendency towards mental disease where before none had existed in a family.[514] Browne hoped that the case would prove a means by which this interest in the family could become an increasing point of demonstrating insanity in criminal cases:

> Juries do well if they compare the transaction with the previous conduct, with the natural and healthy manifestations, of the accused; but this is not doing enough. The investigation must be carried further back, and whenever madness is suspected or pled, it should comprehend the history of the race as well as of the individual.[515]

For Browne, Oxford's case was clearly one where an acquired taint – the grandfather's intemperance – injured his own brain, an injury that was transmitted to the son and grandson, even though it led to different behaviours in each generation.

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513 J. Connolly, 'Lectures', *The Lancet*, no.18, 4:3 (1846), p. 198 (Oxford's case was used to illustrate many ideas about the transmission of illness: Connolly, in recounting his treatment of Edward Oxford, placed stress upon the great anxiety and nervousness experienced by the mother during her pregnancy, due to her husband's alcoholic rampages.)

514 Browne (1841), p. 12.

515 Ibid., p. 12.

Conclusion

This chapter has argued that while asylum doctors faced challenges in bringing authenticated instances of hereditary madness that could be explained by appeal to the inheritance of acquired characteristics, they still succeeded in drawing upon their patient's lives and testimonies in order to furnish evidence for the idea. Further, this activity was mirrored by a search for evidence by amateur phrenologists and also by medical phrenologists that were not attached to asylums. Phrenology offered what Van Wyhe has characterised as 'an easy way' into scientific activity and participation.[516] At the same time, however, Van Wyhe presents *The Phrenological Journal* as a means by which eminent phrenologists could distinguish themselves from traveling doctors and performers.[517] These tensions, I have argued, are not unique to phrenology: efforts to develop communities of science-minded gardeners and farmers also provided an apparently easy means by which literate practitioners could distinguish themselves in a newly-established journal or periodical. But these journals and periodicals also served as a means for creating a new class: the unscientific, the ignorant practitioners, those operating outside of the shared knowledge that these publications sought to diffuse. For the asylum doctors considered in this chapter, phrenology had either served as a means of promotion in the medical field or as a worthwhile framework of diagnosis – but these doctors were, I would contend, more at ease with the doctrines of heredity that they found available within the phrenological tool chest than they were the fine delineations between different organs of the mind.

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516 Van Wyhe, J. (2004), p. 78.

517 Ibid., p. 77.

Why was there such a widespread interest in heredity in European medicine at this point in the 19th century? Muller-Wille and Rheinberger have speculated that "the new scientific profile that physicians sought to establish for themselves made it advisable to acknowledge the limits of medicine, particularly in treating incurable, constitutional, and thus heritable diseases."[518] For Andrew Scull, the idea of *hereditary* illness, particularly hereditary insanity, was another means by which medical figures could assert their dominance and position within an industry that included asylum superintendents with no medical training.[519] Certainly, Browne, Paul, and the other asylum doctors here considered, might have appealed to hereditary illnesses as a means of presenting the limits of medicine to the wider public. The idea of the inheritance of acquired characteristics would easily facilitate such a climate, as the hereditary taint might be demonstrable in the vices or moral shortcomings of any of the parents or grandparents. However, there is a pervasive element of optimism in the pursuit of an understanding of hereditary illnesses across the asylum reports, medical and phrenological journals of this era that isn't adequately addressed by appealing to the 'limits' of medicine. Especially if, as Scull has argued, by labelling illnesses hereditary, doctors were working to extend their authority, to claim these cases as inherently medical cases, requiring their attention.

By pointing to the many ties that medical authorities in this period had to phrenology, I hope to have provided some explanation of this spirit of optimism, of this shared belief that a means of investigation and understanding had just been

518 Muller-Wille, S., & Rheinberger, H.-J., (2012), p. 66.

519 A. Scull, *Madhouses, Mad-Doctors, and Madmen: The Social History of Psychiatry in the Victorian Era* (London, 2015).

uncovered, and that medical authorities were finally getting to the root of a question that previous generations had failed to understand. The inheritance of acquired characteristics – fuelled by the new attention to patient testimony – provided a means of extracting family details and history that were suddenly significant and important pieces to a larger puzzle, relating not just to the treatment of patients, but the improvement of the race. Anxiety over marriage and the adoption of temperate habits gained fresh medical significance. No figure was able to produce as many cases as their attested belief in the principle of the inheritance of acquired characteristics required. Browne's essay on hereditary insanity is noticeably padded with cases that are not his own. Hereditary cases were difficult enough to produce: how could the asylum doctor identify the origin of the taint? Most authorities, like Browne, insisted that the taint originated in some accident or bad habit adopted back in the family line; but it also seems to have become clear that such taints could extend much further back than medical enquiry permitted.

This suggests that agriculture and gardening may have been more significant sources of evidence of the inheritance of acquired characteristics than medicine, despite the widespread prevalence among doctors for the belief that intemperance, immoral living, or neglect of the body in favour of academic pursuits had observable effects upon offspring. Is this a result of influence from botany and agriculture upon medical students? As I showed at the end of the last chapter, physicians – including numerous asylum doctors – received an education that included a strong emphasis on plant heredity. Doctors like Burnett at the University of London turned to the opportunities in botany and gardening to try and establish themselves in academic and scientific communities beyond the human case. Jocelyn Holland has written on how 18th century Goethe, Herder, and Fichte all drew parallels between the human and plant case that would have an influence on continental and British science.[520] The significance of training and education in plant heredity and hybridization during medical training becomes even more prevalent towards the close of the 19th century. James Trent has argued that Charles Davenport's views on feeble-mindedness were greatly influenced by his earlier work in plant heredity.[521] Likewise, Marius Turda has argued that the botanist Artur Brozek used his experiments on plant hybridization to further his arguments for eugenic thinking.[522] Thomas Laycock, discussed below, suggested during his career that plants shared consciousness with animals and humans.[523] It was a suggestion that earned him criticism, but only on the score of his indulgence in philosophical speculations.

More so than in previous chapters, the authorities presented here have traditionally been counted as anti-religious giants in an age of science still dominated by Anglican authority. For Van Wyhe, Combe's *Constitution of Man* provided an alternative to Christianity, Combe having positioned himself just within the bounds of acceptable discourse on religion to avoid the appearance of atheism or materialism.[524] While Combe's *Constitution of Man* is only considered

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520 J. Holland, '*Zeugungl Fortpflanzung:* Distinctions of Medium in the Discourse on Generation around 1800', *Reproduction, Race, and Gender in Philoosphy and the Early Life Sciences* ed. S. Lettow (London, 2014), pp. 83-105.

521 J. Trent, *Inventing the Feeble Mind: a history of mental retardation in the United States* (London, 1994) p. 170.

522 M. Turda, *'Blood and Homeland': Eugenics and Racial Nationalism in Central and Southeast Europe, 1900-1940* (London, 2007), p. 147.

523 T. Laycock, '*Further Researches on the Functions of the Brain*', *The British and Foreign Medico-Chirurgical Review* (July 1855), pp. 175-188.

524 Ibid., p. 195.

briefly in this chapter, the claim that the inheritance of acquired characteristics was an understanding of heredity that preserved a religious understanding of nature seems *prima facie* difficult to maintain in all cases. Combe did explain, in his consideration of nature, that: "We perceive here the physical world gradually *improved* and *prepared for man*."[525] This idea – that nature has been created to suit humanities' needs, that wild animals and plants were created to be tamed by the application of civilisation and cultivation, is at the centre of the biblical worldview I drew forward in chapter one. Still, Combe's *Man* has adapted himself to nature; "The order of creation seems not to have been changed at his introduction," Combe tells us – "he appears to have been adapted to it."[526] For Van Wyhe, the first statement is part of Combe's efforts to avoid accusation of materialism, and the second statement represents his true views.

As I will show in Chapter Five, the message that the Combe brothers communicated through the *Journal* and through the *Constitution of Man* was not only connected to their private views and personal faith. The evidence that they compiled, and the means they put forward as a scientific approach to the importance of moral and temperate habits, were of critical use to the temperance movement, and as they were so cleanly separated from the question of transformism, posed no structural threat to the tenets and worldview of Christian theology.

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525 A. Combe, *The Constitution of Man*, (Edinburgh, 1828), p. 6.

526 Ibid., p. 6.

Chapter Four: 'Sifting, condensing, and sorting': physiology, evidence and the significance of compilers

Introduction

The 1820s saw a proliferation of magazines and journals aimed at a readership that was intended to be newly interested in scientific matters. Whether the subject was family illness, how to breed livestock, or how to improve and acclimatise plant varieties, consumers of these magazines were pointed towards the methods and instructions of science. They were presented with cases – sometimes contributed by amateur practitioners, more often by figures already successful in establishing some wider scientific authority – that made visible the workings of nature, and promised guidelines, methods, and rules for avoiding deterioration both in the family and in one's livestock and garden. Baconian induction – the belief that the accumulation and comparison of instances of a phenomenon could yield new knowledge – was popular, and many of the editors and writers invested in this idea of practicing communities of amateurs urged the collection of more evidence. But this collection and accumulation of cases was having its effect on other levels of scientific activity. According to Desmond (1989) and many others, the gradual retreat of Anglican authority on questions of geology, human reproduction, and the arrangement and order of species allowed the proliferation of a new authority: appeal to nature. Van Wyhe, in his revision of the history of phrenology, presented phrenologists as symptomatic of this important shift: appealing to Nature as the ultimate authority.[527] In their work on the moral authority of nature, Lorraine Daston and Fernando

[527] Van Wyhe (2004), pp. 103-4.

Vidal stressed the significance of *necessity*: facts attributed to the natural order that are unavoidable, which can be writ into the body or natural circumstances.[528] For Adrian Desmond, the appeal to nature represented a radical, and usually clear transition from a world dominated by God's order to an impersonal, mechanical nature. I have so far argued that written into this appeal to nature are appeals to ideas, rules, and laws familiar to a Christian society: the inheritance of acquired characteristics being one of them. Where transmutation was clearly at odds with biblical views, the inheritance of acquired characteristics was an understanding of reproduction that both religious and non-religious authorities found useful and appealing. When phrenology split on the question of religion, proponents of the inheritance of acquired characteristics were found on both sides. And as the big books of the era were composed – Prichard's *Researches into the Physical History of Mankind,* Lyell's *Principles of Geology,* Combe's *Constitution of Man*, Carpenter's *Principles of Physiology* – though their readership and success varied, their inclusion and consideration of the inheritance of acquired characteristics was remarkably consistent.

In Chapters One to Three, I focused on how efforts to compile evidence relating to animal breeding, gardening, botany, phrenology, and the treatment of asylum patients produced an ever-expanding discourse on the inheritance of acquired characteristics. In this chapter I turn to a different kind of compilation that was occurring during this time: the efforts by recognised, established authorities to compile works of more scope and general significance. Whether in regard to physiology, geology, or encyclopaedic knowledge, cases of the inheritance

528 L. Daston, & E. Vidal (eds), *The Moral Authority of Nature* (London, 2004), p. 6.

of acquired characteristics were drawn upon as evidence to support new ideas about the laws of nature and the limits of human improvement and power. These works came at a time when the development of specialist disciplines became entangled with the pervasive dream of encyclopaedic science. As Yeo argued in *Reading Encyclopaedias*, "By the second quarter of the nineteenth century, the departure from the ideal of the unity of knowledge was twofold. First in spite of the presence of the *metropolitana* and some continued appeals to the older rhetoric, the organization of most encyclopaedias recognized and perhaps reinforced the primacy of specialist disciplines. This occurred at a time when it had just become possible to satirize the prospect of the omniscient individual."[529] For Yeo, it was important to recognise the role encyclopaedias played in promoting specialist disciplines, even as they seemed to promote an 'omniscient reader', who would profit from the combined lessons of all sciences. Still, recent historians have suggested other means by which these works were consumed. Gowan Dawson has suggested that serialised works like *The Penny Cyclopaedia* were consumed like periodicals or serialised novels.[530] Whatever their price, whether serialised or published in a series of more expensive volumes, these works gave new life and legitimacy to many anecdotal cases and stories that supported the inheritance of acquired characteristics.

As in other spheres, contests for authority in print served more material ends, and the battles and contests over ideas of heredity are part of larger

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529 R. Yeo, 'Reading Encyclopedias: Science And The Organization Of Knowledge In British Dictionaries Of Arts And Sciences 1730-1850', *Isis: A Journal Of The History Of Science,* no. 82 (1991), pp. 24-49, p. 48.

530 G. Dawson, 'Paleontology In Parts: Richard Owen, William John Broderip, And The Serialization Of Science In Early Victorian Britain', *Isis*, 103/4 (2012), pp. 637–67, p. 639.

competitions. The inheritance of acquired characteristics was widely espoused by medical men, but efforts to produce clear cases of the principle at work in families had not been as successful as efforts to produce instances in agriculture, botany, (and phrenology). As 'physiology' became a means of unifying scientific knowledge, medical authorities found themselves borrowing heavily from agricultural and botanical thought in order to illustrate the hereditary laws to which they appealed to explain illnesses and the origin of the human races. Joan Lane, in her work on the social history of medicine, has portrayed the publishing habits of physicians as writing for an audience that extended well-beyond their own field, and argues that the publishing habits of practitioners is integral to understanding the relationship of medicine to society:

> Throughout the eighteenth and nineteenth centuries, a surprising number of practitioners were authors, both on medical and other topics. Physicians as authors might be expected, educated men with elite patients, and many indeed were well-known and prolific medical writers, such as Richard Meade. However, other relatively unknown practitioners, both physicians and surgeon-apothecaries, turned their observations and case-notes into publications. Certainly authorship was a means of being recognised and for some, anxious to advance their careers, this must have been a strong motive. Simmons noted medical publications, and often MD dissertation topics, in the 1779 *Register* but had discontinued doing so by 1783, presumably because the list would have been very lengthy indeed. However, not all medical publications were for other practitioners, for many were widely advertised in the contemporary press and bought by a lay readership, as can be seen from the number of copies in gentlemen's libraries.[531]

The idea that the social currency provided by publication on 'scientific' concerns was a significant factor contributing to the serial press has been pressed as explaining why certain topics – the nebular hypothesis, the science of race, and

531 J. Lane, A Social History Of Medicine: A social history of medicine: Health, healing and disease in England, 1750-1950 (London, 2001), p. 23.

theories of life – receive such prolific attention in the 19th century. At the same time, however, publishers did not exist to merely aid physicians in extending the reach of their own reputations. Medical publishers were not as interested in promoting the reputations of their authors as were the physicians themselves. John Churchill (as discussed in the introduction above) rejected works that he thought were more likely to promote the reputation of an author than to repay commercially. He also rejected works that he gauged would earn the author new patients, but fail to sell in large numbers.[532] Medical writers had to convince their publishers that their works held commercial viability for a wider readership. When the botanist Burnett proposed a cheap introduction to botany, received an advance, and then supplied a lengthy tome outlining an ambitious classification scheme, Churchill responded that he had been deceived and was now out of pocket, having been given a text that might have been a key work among a select group of botanists, but had no commercial possibility.[533]

Lane's observation that publications that we would designate 'medical' had wider readerships fits a larger pattern of historiographical engagement with 19th century periodicals, supported strongly by Corsi and suggested by the editors of the recent *Archives internationales d'histoire des sciences* (2014) that “each and every journal represents a stand-alone story and model.”[534] In other words, not only should the invitation to form categories such as 'medical publications' or 'general interest publications' be resisted, but even concepts like 'periodical' or 'dictionary'

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532 J. Churchill to L. Parker, 31st August 1843. MS1393/M3/133.

533 J. Churchill to G.T. Burnett, 28th Feb. 1835. MS1393/M3/30.

534 J. M. Peiffer, P. Conforti, P. Delpiano (eds), ‘Scholarly journals in Early Modern Europe. Communication and the Construction of Knowledge’ in *Archives internationales d’histoire des sciences*, fasc. 170-171, 63 (June 2013).

or 'encyclopaedia' may obscure the unique and complex readerships that individual publications enjoyed. Hence, this chapter groups together a variety of works across genres in the 1830s and 1840s that shared one means of production: compilation. They sought to promote a grand vision of nature, drawing from numerous sources of authority and knowledge available, with an aim to being big players in the competition for authority. Anecdotal stories, unusual cases and reported observations were the fodder that fed these productions, and in turn these large works gave these pieces of evidence new legitimacy.

In this chapter, I turn briefly to providing some helpful context for what 'physiology' signified and meant in Britain prior to the 1870s, when the discipline began to take a shape more akin to its contemporary focus. I then proceed to survey the treatment of the inheritance of acquired characteristics presented in some of the largest works of the 1820s and 1830s – focusing on the writing of James Prichard, George Combe, William Lawrence, and Charles Lyell. Each of these authors compiled and put to use anecdotal stories that supported the inheritance of acquired characteristics, but for different purposes and aims. In this section, I make the argument that these works – particularly in their revisions – place an *increasing* importance and legitimacy on the inheritance of acquired characteristics. This increasing legitimacy is, I argue, part of the result of the industry I discuss in chapters 1-3, but it is further supported by serialised encyclopaedias, which provided a unique means of diffusion and proliferation of the inheritance of acquired characteristics. I look at how various medical contributors to *The Penny Cyclopaedia* drew a host of different illnesses and conditions under one shared hereditary explanation. Finally, I survey the works of physiologist William Benjamin Carpenter to provide a final case where we see a continued investment in compiling and presenting evidence for the inheritance of acquired characteristics. Carpenter's work is particularly important due to his reputation and the strong influence that he had upon later figures: Herbert Spencer, Charles Darwin, George Romanes, and numerous other heavyweights of the 19th century.

Physiology and the science of compilation

In 1864, Darwin wrote to Thomas Huxley and encouraged him to write an introduction to zoology. The only one that he knew of at the time was Carpenter's *Popular Cyclopaedia*, he explained – but he did not think that the writing of such a treatise would be that taxing. “If you were to keep a portfolio open for a couple of years,” he suggested, “& throw in slips of paper, as subjects crossed your mind; you would soon have a skeleton (& that seems to me the difficulty) on which to put the flesh and colours in your inimitable manner. I believe such a Book might have a brilliant success.”[535] Darwin made the compiling of such a work sound almost careless – slips of paper that fall into a portfolio. Yet it is exactly this 'methodology' – throwing slips of paper in a portfolio over time – out of which developed many 19th century concepts of heredity. A medical or animal anecdote that is thrown in the portfolio is one that *survives* – and becomes familiar and authoritative to a new generation. Well into the 1890s, anecdotes from treatises and cyclopaedias like those compiled by Carpenter were still being deployed in debates over the mechanisms of heredity. These slips of paper and portfolios, trivial as they might

535 C. Darwin to T. Huxley, November 5 1864, in F. Burkhardt (ed.), *Darwin Correspondence Volume 12: 1864*, (Cambridge, 2001), p. 399.

seem, sorted out what was *pertinent* to nature. As Thomas Huxley reflected in the 1880s, Carpenter's textbook *Human Physiology:*

> ...was the standard work on the subject in this country at that time [...] The 'forties' constituted a period of transition between the old physiology and the new, between the science of Haller and Bichat and the science of Ludwig and Claude Bernard. [...] Dr Carpenter undertook the important office of intermediary between the rapidly accumulating masses of new knowledge and the student of physiology. Sifting, condensing, and methodically arranging the materials.[536]

If there was a science of heredity in the 19th century prior to Galton, we cannot understand it by looking at it as a linear progress of experiment and observation. The science of heredity was produced by 'sifting, condensing, and arranging' animal anecdotes and patient case studies that were often decades (or in some cases centuries') old. There is no individual who furthered this art like William Benjamin Carpenter. I argue that there are religious and political motivations at work in the popularization of the idea that acquired characteristics are transmitted to offspring that we can trace particularly in the developing thought of William Benjamin Carpenter. Carpenter makes an ideal case study because his publishing career stretches from the 1830s to the 1880s. He lost interest in editing his physiological treatises in the 1860s and passed this work down to other editors, but this coincided with a series of important publications in *The Contemporary Review*, and it is not difficult to see how Carpenter used these articles to further the ideas and methods he had developed in the production of his treatises and encyclopaedias.

In the history of medicine, physiology has received careful attention in the

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[536] Huxley's letter is quoted in: W. B. Carpenter. *Nature and Man (*New York, 1889), p. 57.

last two decades. Much of this focus has been on the development of experimental physiology and its impact on medicine and society. For Thomas Bonner, physiology was one of the sciences that emerged from the scientific revolution of the 18th century, taking the form of an experimental science that began in universities in Germany and slowly moved eastward.[537] The absence of training in the microscope and laboratory instruction rendered Britain deeply behind the Germany and France until the 1860s.[538] For Roy Porter, this movement towards a university-based experimental physiology began with Johannes Muller's physiological treatise, published in 1833, and continued by the spread of medical laboratories and the pursuit of experimental medical science.[539] Bynum places more importance on Bichat, and his insistence on the primacy of physiology.[540] However, while British medical writers were reading the science from the continent, the general opinion among historians of medicine was that this information was slow to change medical practice in Britain. As Anne Digby has noted, changes in physiological knowledge didn't immediately translate into increased power in the physician's hands to treat disease.[541] Digby further argues that the proliferation of institutions making an effort to reform the teaching of chemistry and physiology did not "instil a more scientific mode of observation and thinking in aspirant doctors."[542] In general, historians of medicine have taken a critical view of the state of physiology

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537 T.N. Bonner, *Becoming a Physician: Medical Education in Britain, France, Germany, and the United States, 1750-1945* (London, 2000), pp. 14-35.

538 Ibid., p. 245.

539 R. Porter, *Blood and Guts: a short history of medicine* (London, 2002), pp. 127-135.

540 W.F. Bynum, *Science and the Practice of Medicine in the Nineteenth Century (*London, 1994), p. 45.

541 A. Digby, *Making a Medical Living: Doctors and Patients in the English Market for Medicine, 1720-1911,* (Cambridge, 1994), p. 97.

542 Ibid., p. 99.

in Britain in the early decades of the 19th century, but this shouldn't reflect on the significance of physiological treatises and textbooks to the development of ideas about heredity, or the fortunes of the idea of the inheritance of acquired characteristics. In many ways, the absence of experimental physiology in Britain may have aided the popularity and focus upon the inheritance of acquired characteristics, as the evidence needed to debate the idea was drawn from other books, magazines, and even personal experience.

In telling the story of experimental physiology, some of the work done by compilers in Britain has received less attention, and my focus in this chapter is not on experimental physiology, but on physiology as a compiling or encyclopaedic science. It consisted of sifting and arranging anecdotes and stories from sundry areas of medicine, science, and the general interest periodicals of the day, with an aim to expressing or pointing towards the laws that govern all life. Physiologists celebrated its ambitious spirit rather than attempting to lower the science to mere anatomy. John Bushnan, whose enthusiasm for botany was explored in the last chapter, nonetheless viewed all of his writings as falling under the pursuit of physiology, a science that he positioned at the heart of all human striving:

> Physiology, taken in its largest acceptation, holds a most prominent place in the circle of human knowledge. We have seen it trace the development of the perfect man through the grass of the fields back to the common mineral elements of the crust of the earth. It also enlists in its service Anatomy, Chemistry and not a few departments of general Physics; and it connects itself with Agriculture, Political Economy, and the science of Legislation and Government, hardly less than with Medicine, Surgery and preservation of health.[543]

Because of its wide reach, Roy Porter has positioned physiology as an essential

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543 J. S. Bushnan, *The Principles of Animal and Vegetable Physiology (*Philadelphia, 1854), p. 218.

genre of medical writing, that served to establish authority in an era where no real grounding for medical truth obtained.[544] But it is also difficult to argue that physiological writing was distinct or meaningfully separate from the encyclopaedic print culture of the early 19th century. Indeed, as I will discuss below, one of the most important physiological encyclopaedias of the 1840s and 1850s, Robert Bentley Todd's serialised *Cyclopaedia of Anatomy and Physiology*, was accused in the press of being a continuation of Charles Knight's earlier model for the *Penny Cyclopaedia*. But physiologists also relied upon encyclopaedias for anecdotes and stories that could fill the pages of their own treatises. This activity lent fame and authority to many animal stories and patient cases that first found life within the agricultural and gardening press. But beyond this, even encyclopaedias composed by numerous authors worked to maintain a coherent view on physiological truths.

The inheritance of acquired characteristics was written into some of the foundational ideas of diathesis and illness in 19th century medicine. As William Bynum explained in his (1983) work on Darwin and medicine, a diathesis was a constitutional tendency towards a given illness. "If a patient developed the disease for which he had the diathesis, the point was proved."[545] Diathetic diseases, as Roger French has drawn attention to, were regarded as the product of poor hygiene, intemperance, gluttony, and civilization.[546] Some physicians (like Prichard) disagreed with the idea that injuries inflicted on the constitution were transmitted to offspring, but others (like James Paget) saw in it the means of understanding the

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544 R. Porter, 'The Rise of Medical Journalism in Britain to 1800', *Medical Journals and Medical Knowledge*, (London 1992), pp. 6–28, p. 11.

545 W.F. Bynum, *Darwin and the Doctors* (London, 1983), p. 45.

546 R. French, "The Anatomical Tradition, in W.F. Bynum & R. Porter (eds), *Companion Encyclopaedia of the History of Medicine* (London, 2013), pp. 81-101, p. 94-98.

relationship between climate, circumstances, and the origins of disease. This issue was explored in the last chapter, where I concluded that phrenology and medicine both had investments in producing cases that evidenced this fundamental claim about the transmission of acquired peculiarities. There, I took a wide view of cases that presented evidence of the inheritance of acquired characteristics because to narrow the focus would imply a (false) picture of the era that authorities had a clear means of distinguishing cases that were merely 'hereditary' from the more interesting cases that represented 'inheritance of acquired characteristics.' This distinction was in the process of being made, and as the debates in the 1890s between Spencer and Weismann can demonstrate, the distinction was never satisfactorily arrived at.[547] What I attempt to trace here are how medical writers used hereditary cases to think about larger questions: what causes illness to arise in a family? What do the habits and moral choices of the parents have to do with the constitution of their children? In my treatment of the *Penny Cyclopaedia*, I argue that however ill-defined the discussion of heredity presented by medical contributors, the emphasis was clearly placed on tracing all disease to the inheritance of the parent's constitutions: and we have good reasons to understand the emphasis being placed on characteristics congenital or acquired.

Compilation and the inheritance of acquired characteristics: a brief history

Carpenter wrote physiology treatises; but in content, his books differed little from treatises on geology, race science, and phrenology that had come before, and

547 H. Spencer, 'A Rejoinder to Professor Weismann', *The Contemporary Review,* 64 (December 1893), pp. 893–912; See also: H. Spencer, 'Heredity Once More', *The Contemporary Review,* 68 (October 1895), p. 608. Also: A. Weismann, 'Heredity Once More', *The Contemporary Review,* 68 (September, 1895), pp. 420– 455.

crucially for our purposes, Carpenter styled his treatment of the inheritance of acquired characteristics on these earlier works. Importantly, as I will argue here, there is an observable movement in these works towards placing increasing importance on the inheritance of acquired characteristics as we move into the 1840s.

James Prichard's *Researches into the Physical History of Mankind,* first published in 1813, contained a refutation of the inheritance of acquired characteristics. However, by the 1830s Prichard had abandoned his efforts to compile cases and evidence that refuted the transmission of acquired habits, constitutional weaknesses, and peculiarities. Prichard, like his contemporary William Lawrence, understood chance variation to produce races and varieties, and he viewed chance variation as more common in vegetable species than animal species.[548] He tried to balance and synthesise the various views of hereditary descent that were at his disposal in arguing for the unity of mankind. He knew that a straightforward argument for climate and skin colour was untenable; he tried instead, pointing to the effects of cultivation on plants and domestication on animals, to argue that civilization – in its various forms – had produced the different races of mankind. Generally, he claimed, acquired characters have no influence on offspring.[549] As concerned disease, Prichard conceived of hereditary constitutions that had a natural array of strengths and weaknesses. The first figure in a family to injure one of the naturally weaker elements of the constitution was falsely accused of introducing the 'defect of the race.'[550] Prichard was at pains to

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548 J.C. Prichard, *Researches into the Physical History of Mankind, (*London, 1813), p. 26.
549 Ibid., p. 195.
550 Ibid., p. 203.

argue that mutilations, injuries, and vices – including the transient effects of climate were not transmitted. By these, he understood the 'inheritance of acquired characteristics.' However, Prichard clearly understood cultivation, domestication, and civilization to have some effect on the individual that was transmitted to the offspring. His aim was merely to reject a body of evidence that he viewed as specious and conflicting with his views on the moral responsibility of the individual. When criticising the inheritance of acquired characteristics, Prichard commented that:

> The authors who have brought such examples as these in defence of their opinions, would not probably have thought them worth recording, or indeed deserving of the smallest notice, if they had not happened to coincide with the systems they were advocating.[551]

And yet Prichard was wholly dependent on such cases himself. In his discussion of albinism among slaves in America, Prichard cautioned that the cases he had discussed "are evidently drawn up with great care, and are perfectly well authenticated."[552]

William Lawrence held similar views. In his *Lectures on Physiology* (1822), Lawrence gathered cases from the *Philosophical Transactions* and other sources in defence of the idea that hereditary peculiarities abound in medical and agricultural sciences. Lawrence cited the ancon (otter) sheep, and moving quickly to the human case, he explained "all the native deformities of mind and body, which spring up so plentifully in our artificial mode of life, are handed down to posterity, and tend by their multiplication and extension to degrade the race."[553] Lawrence, however,

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551 Ibid., p. 197.
552 Ibid., p. 31.
553 W. Lawrence, *Lectures on Physiology, Zoology, and the Natural History of Man,* (London, 1822), p. 397.

followed Prichard in deviating from Blumenbach's explanation that climate induced changes in complexion, which were then transmitted to offspring.[554] As Kentwood Wells noted in his (1971), Lawrence noted an increase of *spontaneous* variation in domestic breeds, of which cases like the ancon sheep provided a perfect model: rather than inheriting the acquired effects of domestication, the variations were better understood as arising by chance in embryonic development.[555] Lawrence saw that Prichard's refusal of the inheritance of mutilations must also mean that the effects of climate cannot be employed as a straightforward means of explaining variation. Lawrence advocated chance variation, with propagation providing the means of protecting and developing these new varieties.[556] Still, even Lawrence attributed something to domestication that he could not account for. “The state of domestication,” he wrote, “or the artificial mode of life [...] is the most powerful cause of varieties in the animal kingdom.”[557] Prichard and Lawrence were both at pains during this period to try and separate cultivation, domestication, and civilization from the inheritance of acquired characteristics – but neither proved entirely convincing or long-lived.

Prichard re-wrote his *Researches* several times, and by 1836 the content of the volumes had changed considerably. Prichard had become more interested in conveying the mental similarities of all human races, their physiological similarities, and their capacity to interbreed. By 1836, climate had replaced civilization as a means of explaining variation, and the arguments against the

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554 See K.D. Wells, 'Sir William Lawrence (1783-1867): A Study of Pre-Darwinian Ideas on Heredity and Variation', *Journal of the History of Biology,* no.4, 2 (1971), pp. 319-361, p. 324.

555 Ibid., pp. 325-7.

556 Ibid., p. 441.

557 Ibid., p. 442.

inheritance of acquired characteristics were omitted.[558] Prichard attempted to appeal to altitude to help explain varieties of human races; he still maintained that civilization had some effect, but the argument was not as ambitious as it had been in 1813. The change in view is caused in part by Prichard's encounter with the ideas of Esquirol. Prichard, in looking at hereditary insanity in the 1830s, now said that science must "inquire how and by what means the parents can be so affected as to render their offspring physically weak and predisposed."[559] Prichard's treatises on insanity and on the human races went silent in disputing the inheritance of acquired characteristics. He came to have the same position that George Combe espoused in his 1828 *Constitution of Man* (discussed below), that while mental diseases were not hereditary, injuries to the constitution of the parent – through vice, intemperance, or habit – could 'become' hereditary:

> The morbid state of lunatics cannot properly be said to be innate, but the predisposition is original and in-bred in the constitution. In those cases in which it has not been inherited, it is an individual peculiarity of organization, which is ready to become hereditary in the next generation.[560]

Combe distinguished four varieties of transmission. Temporary conditions (such as insensibility), acquired habits, "the appearance of peculiarities in children, in consequence of impressions made on the mind of the mother," and finally temporary mental and bodily qualities.[561] As Jenkins has observed, Combe drew cases from medical friends, from the *Encyclopaedia Britannica*, the *Edinburgh Review,* from agricultural and farming magazines, and also from the treatises of

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558 J.C. Prichard, *Researches into the Physical History of Mankind,* vol 2., (London 1836) pp. 336-340. This section contained the omitted discussion in earlier editions.

559 J.C. Prichard, *A Treatise on Insanity and Other Disorders Affecting the Mind (*London 1836), p. 123.

560 Ibid., p. 241

561 G. Combe, *Constitution of Man*, 5th ed. (London, 1840), p. 173.

James Prichard.[562] Later editions included new cases. Combe included the case of "W.B. shoemaker in Portsburgh," whose wife gave birth to an idiot after having been affected by the sight of one during pregnancy.[563] Combe also attended to advice given to mothers, citing Margravine of Anspach in claiming that "such is the connection between the mind and body, that the features of the face are moulded commonly into an expression of the internal disposition."[564] In other words, the emotional state of the mother determines the features of the unborn child.

For Combe, the accumulation of these stories were not 'phrenological science'; he called them instead 'inferences'.[565] An inference for Combe was a fact supported by our common ideas of the world, and one that may or may not have been produced by any careful procedure. Combe pointed to negative cases as well. 'Hollanders', 'Caribs', and 'savage tribes', according to Combe, had demonstrated themselves capable of improvement in every corner of the world, so long as they were capable of *desiring* civilization. For Combe, the spread of civilization was proof that it cannot be the case that there is a natural law *preventing* the transmission of acquired characteristics. Generations in savage countries show improvement. The explanation must allow that these new generations have mental capacities that their ancestors lacked. Combe even went so far as to claim that:

> The supposed law would be disproved by cases of weak, imbecile, and vicious children, being born to parents whose own constitution and habits had been in the highest accordance with the organic, moral, and intellectual laws; but no such cases have hitherto come under my observation.[566]

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562 Jenkins (2015), pp. 470-473.
563 Combe (1840), p. 176.
564 Ibid., p. 182.
565 Ibid., p. 183.
566 Ibid., p. 195.

The negative case, for Combe, gave the inheritance of acquired characteristics an extra level of credibility. For Combe, sceptics would have to demonstrate the chance and random appearance of debilities; a difficult effort to conduct when the opportunities to discover slight aberrations on the part of the parents are so vast.

Another important work that included a list of cases in support of the inheritance of acquired characteristics was Charles Lyell's second volume of *The Principles of Geology* (1832). Lyell maintained a belief that acquired habits and peculiarities could be transmitted to offspring so long as they extended from the natural habits of the animal.[567] While rejecting Lamarck, Lyell allowed that: "some acquired peculiarities, of form, structure, and instinct, are transmissible to the offspring; but these consist of such qualities and attributes only as are intimately related to the natural wants and propensities of the species."[568] As evidence, he described greyhounds imported to high altitudes in Mexico by Real del Monte. The first generation were unable to flourish at the altitude – succeeding generations were as quick and reliable as their European counterparts.[569] Lyell presented the case of Spanish horses that are born able to 'amble', a trotting pace that had been habituated by their ancestors for generations until it became hereditary.[570] Lyell borrowed cases reported by John Corse to Joseph Banks in 1799 detailing the training of elephants in Bengal.[571] While Corse made no mention of the inheritance

567 C. Lyell, *Principles of Geology,* vol. 2 (London, 1832), pp. 38-39.
568 Ibid., p.611. Lyell's views on the importance of the 'natural wants and propensities' of the species can be traced back to Kant and Blumenbach's views on race and climate. For Lyell's reliance on the inheritance of acquired characteristics, see: T. Pearce, 'From 'Circumstances' to 'Environment': Herbert Spencer and the Origins of the Idea of Organism-environment Interaction', *Studies in History and Philosophy of Biological and Biomedical Sciences,* 41 (2010), pp. 241–52, p. 241.
569 Lyell (1832)., p. 40.
570 Ibid., p. 44.
571 J. Corse, 'Observations on the Manners, Habits, and Natural History, of the Elephant',

of acquired characteristics, Lyell used his descriptions of elephants as an example of the hereditary effects of domestication – and, most importantly, of their limits. Elephants were naturally capable of domestication; Lyell viewed some of their domestic habits as the product of the inheritance of acquired characteristics. His concern was that there existed a natural limit to this progress.

Prichard, Lyell, and Combe were invested in very different goals. Prichard's career-long concern was to author a scientific defence of the unity of mankind that united with the scriptural themes then-popular in his Unitarian community. In his early career he viewed the accumulation of stories and cases that evidenced the inheritance of acquired characteristics with doubt; but over the decades such a position became increasingly untenable. While he didn't compile cases in favour of or against the view of heredity, he made room for it in his accounts of insanity and the origin of the human races. For the Combe brothers, the inheritance of acquired characteristics was a cornerstone of the phrenological worldview: it couldn't be argued for by appeal to phrenological methods, but it could be inferred by the careful accumulation of authoritative cases. Lyell, fearful of being tainted by charges of materialism and eternalism by his uniformitarian views, set out in the second volume of his *Geology* to distance himself from the ideas of Lamarck – and later spread his discussion of Lamarck across separate volumes.[572] At the same time, he was anxious not to reject the evidence for the inheritance of acquired characteristics, going out of his way to include evidence in favour of the idea. While

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Philosophical Transactions of the Royal Society, 89 (January 1799), pp. 31-55.

572 See P. Corsi, 'The Importance of French Transformist Ideas for the Second Volume of Lyell's Principles of Geology', *The British Journal for the History of Science,* 39 (1978), pp. 221-244. See also: M.J.S. Rucdwick, 'Lyell and the Principles of Geology', *Geological Society, London, Special Publications,* no.143 (1998), pp. 1-15, p.8, pp.12-13.

Prichard and Lawrence worked to separate the influence of cultivation, domestication, and civilization from the inheritance of acquired characteristics, authorities like George Combe used these phenomena as evidence *for* the inheritance of acquired characteristics: by the 1840s, Combe's view had largely erased the memory of efforts by Prichard and Lawrence to separate the question.

The physiological and encyclopaedic press: readership and contributors

Prichard, like many writers that found success in a treatise, revised his work over the years to reflect the state of medical thought. The disappearance of his arguments against the inheritance of acquired characteristics in the 1820s is evidence that something was changing in Prichard's intellectual climate. He never seems to have endorsed the idea of the inheritance of acquired characteristics, but he abandoned efforts to separate his ideas about race and madness from it. Later in the chapter, I will look at Carpenter's various encyclopaedias and physiological treatises in order to argue that in Carpenter's work, we also observe an initial hesitation over the idea of the inheritance of acquired characteristics, which in his case is replaced by total commitment later in his career.

How can we explain these shifts? Prichard and Carpenter both rejected Lamarck's ideas, and there weren't enough Lamarckians active in Britain to explain why Prichard, Lyell, Carpenter, and others, would actively make space for the inheritance of acquired characteristics in their work. It makes more sense to view this as a shift that is trying to reflect wider opinion: these figures all shared a sense that there *was* widespread acceptance and belief in the inheritance of acquired characteristics among their readership. This may have taken the form of belief in acclimatisation, or the transmission of injuries and weakened constitutions, or the inheritance of the positive effects of cultivation and domestication on plants and animals – all of these different varieties of evidence could be brought into the defence of the inheritance of acquired characteristics or rejected, and many authorities preferred certain forms of evidence to others. But with publications like *The Penny Cyclopaedia*, there emerged for the first time a vast collection of knowledge that sought, by the cooperation of its contributors and editors, to present a unified understanding of heredity. The inheritance of acquired characteristics, as Van Wyhe has alluded, meshed nicely with Whig themes like education, utility, and social progress.[573] Through the *Penny Cyclopaedia*, numerous illnesses and conditions were presented by contributors as arising through the moral, temperate, and hygienic failings of previous generations.

The *Penny Cyclopaedia*, published from 1828 to 1843, included strong condemnations of Jean-Baptiste Lamarck's transformist views and also of phrenology. But a consistent endorsement within the medical entries (composed by numerous contributors) of the very ideas that the young Prichard argued against are present in the volume from their first number to their final. With its popular aims and wide readership (including Darwin) and economical cost, *The Penny Cyclopaedia* provides an excellent means of understanding how larger works based on compilation utilised the same markets and readership that agricultural magazines, gardening magazines, and even phrenological journals all competed for. In 1833, a bookseller in Cornwall was requested by *The Society for the Diffusion of Useful Knowledge* to try and calculate how many issues of the serialised cyclopaedia

573 Van Wyhe (2004), p. 193.

had been sold recently. He replied to the committee that he had sold fourteen: "3 copies to gentlemen – 4. Surgeons – 1. Solicitor – 3. Tradesmen – 1. Clerk to an attorney 2. – to apprentices."[574] The figures of sale might have been lower than the Society would have wished, but the class of the readers consuming the *Penny Cyclopaedia* would not have surprised Charles Knight. Often portrayed as targeting an audience consisting of labourers and the working classes, people that could not before have afforded knowledge and whom, while literate, had no access to scientific or historical literature, the *Society* in fact had ambitions beyond making knowledge merely *accessible*. Knight put forward the idea of serialised encyclopaedia as one that would not only be affordable to all, but as one that would "be rendered attractive to all classes of readers."[575] The *Penny Cyclopaedia* would not only be the cheapest ever published,[576] but it would distinguish itself from encyclopaedias available only to the wealthiest readers by providing references to authorities.[577]

Knight's model for the *Penny Cyclopaedia* was the German *Conversations Lexikon*, which had recently been translated into English and published in the United States.[578] The *Penny Cyclopaedia* would never reach the influence and

574 Anon. Cornwall. 1833. SDUK Coll / Special Topics / Penny Cyclopaedia / "General Affairs of the Society." / 11.

575 SDUK Coll / Special Topics / Penny Cyclopaedia / "General Affairs of the Society."/ 1.

576 SDUK Coll / Special Topics / Penny Cyclopaedia / "General Affairs of the Society."/ 4.

577 SDUK Coll / Special Topics / Penny Cyclopaedia / "General Affairs of the Society."/ 3. Thomas Knight on previous encyclopaedias – besides their cost and volume, "there were in these no attempts of condensation – and few references to authorities where more complete information might be obtained. The circulation of these works, however considerable, was necessarily limited to the rich."

578 "In other countries the wants of the age were better understood. In Germany, Mr Brockhaus, a bookseller of Leipzig projected and fully edited the *Conversations -Lexikon*, a work designed to impart a general knowledge of all subjects that were matters of enquiry and conversation amongst well-informed persons [...] This work consists of 12 volumes 8; – and 80,000 copies exclusive of two private editions, have been sold since 1812 [...] in 1829, an English translation, with considerable alterations and additions, was commenced in the United States." SDUK Coll /

success of the *Lexicon* – editors towards the end took reductions in pay, subscribers sent letters complaining that the *Cyclopaedia* was being published far too slowly, and while Knight was surprisingly accurate in his prediction that there was a market for serialised alphabetical knowledge, the *Cyclopaedia's* readership never matched that of the *Penny Magazine*.[579] But the *Cyclopaedia* did succeed in becoming an authoritative source in medical and physiological letters. The editors of the *Cyclopaedia* understood its power to bestow or withhold authority on medical questions – and Knight insisted that each issue must contain "articles on matters of universal interest popularly treated – The History of Geography [...] and much of the Natural Philosophy."[580] William Benjamin Carpenter drew heavily from the *Cyclopaedia* during his most active years in the 1840s and 1850s in penning his own treatises, textbooks, manuals, and popular encyclopaedias. It provided a cheap means for many authors to obtain a current collection of scientific views. When one looks at what surveys of readers and subscribers the *Society* succeeded in obtaining, physicians and gentlemen always made up a good proportion of its readers.

Contributing to the *Penny Cyclopaedia*

Contributing to cyclopaedias was of professional – and sometimes political – utility to the physicians of the day. And the *Society for the Diffusion of Useful Knowledge* had enough interest from the medical profession to turn many potential authors away. Richard Poole, working then as the editor for *The Phrenological Journal*,

Special Topics / Penny Cyclopaedia / "General Affairs of the Society."/ 7.

579 Long's salary and the scope of the project was reduced in 1836. The contrast in sales was understood as inevitable from the start of the project. For criticism of the delays in finishing the *Cyclopaedia*, see SDUK Coll/ Anon / 45, 46-48, 53.

580 SDUK Coll / Special Topics / Penny Cyclopaedia / "General Affairs of the Society."/ 28.

wrote in 1835 to inquire if there were any articles planned to which he might be able to contribute.[581] No response from Thomas Coates survives, and neither are there any contributions from Poole contained in any of the SDUK publications (phrenology never having won the designation of 'useful'). A young Robert Bentley Todd, who would commence publication of his own serialized cyclopaedia in the 1835, contacted the Society in 1827 hoping to have a role in the production of the *Penny Cyclopaedia*. He tried to find his way in through recalling his father's reputation: "I believe that as the son of the late Mr Todd, Professor of Anatomy to the Royal College of Surgeons in Ireland, my name is known to some members of your committee."[582] But Todd, like Poole several years later, would have no luck in contributing to the *Cyclopaedia,* or any of the other treatises that the Society published. Neither Poole nor Todd suggest articles aimed at a general audience. Todd proposes a detailed history of anatomy that would, he promises, be the most authoritative of its kind.[583] Both Todd and Poole are anxious to relate their status and their credentials as physicians. Both are unsuccessful in their bid to be of aid to the Society.

Lant Carpenter, William Benjamin Carpenter's father, spent two years in negotiations with Thomas Coates about possibly contributing an article on mental and moral philosophy to the *Penny Cyclopaedia*. Carpenter had already contributed such an article to *Rees' Cyclopaedia* and from Carpenter's discussions with Rees it seems that he hoped the Society would largely reproduce his existing essay.[584] From

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581 SDUK Coll / R. Poole to T. Coates, 25th April 1835 / 1-2.
582 SDUK Coll/ R. B. Todd to T. Coates, 24 May 1827 / 1-7.
583 Ibid, p. 1.
584 R. L. Carpenter, *Memoirs of the Life of the Rev Lant Carpenter*, (London, 1842), pp. 192-193.

a pragmatic perspective, Lant Carpenter was in poor health in 1827, he was being cared for by his daughter Mary and income from publishing already written essays would have been certainly welcome.[585] Yet by no means was involvement in the Society's publications a mere means to financial gain (when it was able to pay its authors) nor mere status – but being run under the aegis of the same individuals that had founded the University of London, the Society came to provide its contributors a means of influence on University. As Russell Lant Carpenter wrote in 1842, when recalling his father's career: “The Dissenters at that period (1827) looked forward with great hope to the new London University [...] as an engine for promoting the cause of liberal education in England.”[586] Lant Carpenter hoped that Dr. Blaire would be appointed to Chair of English Literature, to cement the influence of the Unitarian sect in the educational sphere. When Dr. Blaire was unsuccessful, Lant Carpenter expressed his dissatisfaction via the Society. Carpenter duly wrote to Coates that “I need not say to you how greatly I felt disappointed at the decision [...] respecting my friend Blaire's application.”[587] Carpenter thought they *ought* also have provided him with an influence extending to the political inclination of the University based on his position as a (would-be) contributor.

Hereditary illnesses and conditions in the *Penny Cyclopaedia*

It was Knight's insistence that the alphabetical ordering of the *Cyclopaedia* should not mean that individual issues lacked interesting and topical content – and individual entries often appeared under titles that appear arbitrary and unlikely if

585 Ibid., p. 294.
586 Ibid., p. 317.
587 SDUK Coll / Lant Carpenter 14th April 1828 / 2.

we view the cyclopaedia in its entirety, but which in serial form make more sense. For example, in the first issue an entry on body fat appears under the title 'adipose substance,' written by the contributing physician William Coulson. He helped Thomas Wakley to found the *Lancet*, though at such an early stage in his medical career that he kept his entries anonymous.[588] He translated both Milne-Edwards' *Anatomy* and the 1827 edition of Blumenbach. Charles Knight singled him out for passing praise in his 1864 memoirs, noting that while editing the *Penny Cyclopaedia* "I was in more direct and constant intimacy with Mr William Coulson, the translator of Blumenbach's "Comparative Anatomy."[589] Charles Knight and Thomas Wakley were not the only prominent figures that the young Coulson had dealings with. As a young surgeon in London, posts were difficult to come by, and so Coulson co-founded the Aldersgate Street school of medicine with William Lawrence. Politically liberal, interested in social reform, and having spent several years studying in Berlin and in Paris, Coulson viewed himself as an integral part of a publishing world that sought to educate and inform all readers on the subject of health and the nature of life. In such articles, Coulson was able to point to the diseases of the aristocracy and tie deformities like obesity to the habits of the family. Hence the real topic of the entry is, in fact, not on fat tissue itself, but the question of heredity. As Coulson writes: "There are persons who never become fat at any period of life, however sound the health, however good the appetite, however favourable the circumstances for the formation of this substance."[590] Opposed to these persons untainted by fat, there are those that, from their parents and

588 D.I. Williams, 'William Coulson: Victorian virtues handsomely rewarded', *Journal of Medical Biography,* 2 (1994), pp. 133-34
589 C. Knight. *Passages of a Working Life During Half a Century,* (London, 1864), p. 129.
590 W. Coulson, 'Adipose Substance', *Penny Cyclopaedia,* Volume *1* (London, 1833). pp. 122.

grandparents, have inherited a tendency towards obesity. Coulson explains: “this habit is often hereditary, being received from the parent and transmitted to the offspring for many successive generations.”[591] The idea of a *habit*, acquired in life and then transmitted is one that was familiar to readers of gardening magazines and also phrenological journals, as I have shown.

From its inception, the editors of the *Penny Cyclopaedia* sought to maintain a uniformity of views and opinions on key topics. For example, the entry on “Brain” was written by William Coulson and focused on anatomical detail – but the entry on “Brains in animals” that followed it was written by William Youatt, and focused almost entirely on animal behaviour and reason.[592] The editors included a note between the two entries alerting the reader that they had been written by different authorities, and that this should explain any differences.[593] There would have been no need for such a note if the *Cyclopaedia* was, like a medical periodical or journal, a lexical space where disagreement and conflict was possible, or welcome. But the editors of the *Penny Cyclopaedia* were concerned to present a coherent picture of science from an early stage in the production. In the years that followed, the multiple writers that contributed entries on disease all presented the same hereditary account: at some point in the family's past, there would be found an individual who had first suffered and then transmitted the tendency to that illness. Youatt used the opportunity to discuss animal brains as one in which he could link physiological structure to his account of divine plans for adaptation. “The different development of the medulla oblongata in different animals may be adduced as

591 Ibid., p. 122.
592 W. Youatt, 'Brains in Animals', *Penny Cyclopaedia,* Volume 5 (London, 1836) pp. 334.
593 Ibid.

another proof of the admirable adaptation of each to the situation which he occupies and the functions which he discharges."[594] For Youatt, his religious views did not conflict with an interest in viewing different parts of the brain as dedicated to different functions, and he was eager to present a Christian understanding of how the different organs of the brain evidenced the inherited effects of domestication.

The contributor William Baley wrote the entry on 'Insanity' and offered a near-identical warning, that once an attack of insanity occurred in a family, a hereditary predisposition to the disease could be transmitted. Baley's contribution was published in 1838, and Baley borrowed heavily from Esquirol. However, in doing so he did not deviate from the ideas of heredity that had been set out in earlier volumes. Baley explained:

> An attack of insanity not only produces such a change in the system as to render it more prone to disease than before, but the condition of the body, or rather of the brain, thus induced may be transmitted to children. This fact is so well known that it is unnecessary to insist further upon it. The hereditary predisposition is said to be stronger when both parents have been insane.[595]

As I showed in Chapter Three, it was in fact difficult to insist further on this principle due to the great difficulty asylum doctors had in presenting authoritative cases that spoke to the principle. But resting on a very few cases that had been put forward in the 1830s, this idea maintained its masquerade as one that was 'well known.' Dr. Greenhill contributed the entries on 'Phthisis' and 'Scrofula', and he put forward the same understanding of disease. Namely, that these are fundamentally changes to the constitution of the individual, a "change in the

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594 Ibid.

595 W. Baley, 'Insanity', *The Penny Cyclopaedia,* Volume 12 (London, 1838), p. 486.

general system," as he puts it, and once acquired by anyone, the change in the system will be transmittable to one's offspring.[596] Despite the efforts of Prichard and Lawrence earlier in the century, families were viewed as having been tainted by the actions or injuries of a guilty ancestor once more.

James Paget bore the same suspicion of the parents of epileptics. "If due inquiry be made," Paget wrote on the subject of family histories, "it will generally be found that although the direct progenitors, father or mother, may have escaped, yet that some member of the family, uncle or aunt, grandfather or grandmother, has been subject to fits."[597] Writing on the subject of Pathology, James Paget explained that by 'hereditary disposition', he meant to convey that "an individual [is] constructed with the same peculiarities of internal and external form and composition, which one or both of his parents possessed."[598] Such a definition entails the inheritance of acquired characteristics as a matter of course – and Paget's later views on the origin of illnesses demonstrate that the inheritance of acquired characteristics was an important part of his view of nature. Darwin cited Paget as one of many medical authorities that had proven not only the hereditary nature of many ailments, but that injuries, accidents and mutilations could be inherited.[599] Where medical authors sometimes neglected to focus on the transmission of injuries and accidents, readers (like Darwin) filled in the blanks.

The views of hereditary illness and deformities presented in the *Penny Cyclopaedia* were never far from political advocacy. Charles Baker, who contributed

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596 Dr. Greenhill, 'Phthisis', *The Penny Cyclopaedia*. Volume 18 (London, 1841), / Scrofula. v. 21.
597 J. Paget, 'Epilepsy', *The Penny Cyclopaedia*. Volume 9 (London 1837), p. 475.
598 J. Paget, 'Pathology', *The Penny Cyclopaedia*. Volume 17 (London 1840), p. 317.
599 Darwin (1868A), pp. 79-81.

the article on deafness, used his contribution as an occasion to argue that public institutions (schools for the blind, institutions for the deaf and dumb) required the aid of science in order to improve their service to society:

> The bad effects of in-breeding are known to all who are engaged in the rearing of horses and other animals; it has also produced some melancholy instances in the human race. [...] We conclude this portion of our subject with a powerful conviction that public institutions should unite their efforts for the common improvement of society; that they should obtain every information directly or indirectly bearing upon those cases which come under their observation; and from time to time bring their details into one general form.[600]

Richard Yeo, in his work on encyclopaedias and science, has focused on the *Penny Cyclopaedia* in order to make the point that, given its serial nature, it could not be viewed in its totality as representing that state of the art in medicine: alphabetically, its contents must fall out of date.[601] Yet the various medical contributors to the *Penny Cyclopaedia* maintain a remarkably consistent depiction of heredity across their contributions to the *Cyclopaedia*, spanning many years. This tells us something about how evidence for heredity accumulated: extraordinary cases that supported the idea that peculiarities acquired by the parent were transmitted to the child were included; but the idea of a *study* of how heredity operates across a wider human sample would wait until Galton, and the biometricians that came in his wake.

The rejection of Lamarck in the *Penny Cyclopaedia*

References to Lamarck's work permeate the *Penny Cyclopaedia*. But the biography of him supplied by Richard Meade explicitly rejects his transformist views (and also

600 C. Baker, 'Deaf and Dumb', *The Penny Cyclopaedia,* Volume 8 (London 1837), p. 325.

601 R. Yeo, 'Reading Encyclopedias: Science and the Organization of Knowledge in British Dictionaries of Arts and Sciences, 1730-1850', *Isis*, 82 (1991), pp. 24–49.

misrepresents them). Lamarck's fame in Britain is often presented as being largely a matter of his transformist writings. In fact, he was very well known in Britain in the decades leading up to the publication of *Origin;* but his views on the origins of life, transmutation, and speciation were routinely set to one side by writers that were interested in his work on marine biology, shells, and plants. Lamarck had established a system for conchology that was tremendously popular with collectors in Britain and America, and popular guides to the collection and categorization of shells often utilised Lamarck's system (as presented by de Blainville). The collection of shells and specimens, as Knell (2006) has described, was a widespread activity in Britain that fostered an industry of books and societies. Texts like James Sowerby's *The Genera of Recent and Fossil Shells, for the Use of Students* (1830), and Wyatt's *Manual of Conchology* (1838), drew heavily from Lamarck's work.[602] Volumes like this that provided colourful depictions of shells and marine life were turned out in large volume during the 1820s and 1830s, and the authors usually depended heavily upon Lamarck in aiding the amateur collector in the task of identifying and arranging specimens. The editors of the *Penny Cyclopaedia,* who made texts available to their more important contributors for research, may have made Lamarck's texts available to its contributors on the topics of marine life and botany, given the pervasive mentions of Lamarck throughout the 22 volumes.

After his death, narrated in a dramatic fashion by Cuvier, Lamarck also became an even more important entry in medical and scientific biography. Dying ten years before the *Penny Cyclopaedia* editors reached "L", Lamarck had already become a name immensely familiar to amateur specimen collectors in Britain,

602 J. Sowerby, *The Genera of Recent and Fossil Shells,* (London, 1830) See also: T. Wyatt, *Manual of Conchology*, (New York, 1838).

deserving inclusion in the *Penny Cyclopaedia.* In the biography of Lamarck included in the *Penny Cyclopaedia*, its author (Richard Meade, a friend of James Paget), knowing his audience, commented that, “Lamarck is chiefly known in this country by his excellent arrangement of Conchifera.”[603] Meade, who believed in the idea of the inheritance of acquired characteristics, did take a sentence to articulate Lamarck's views on transmutation. “he pretended that use and circumstances determined the existence of new organs,” Meade wrote, dismissing Lamarck's explanation of transmutation without considering it as bearing any relationship to the familiar and trusted notion of the inheritance of acquired characteristics.[604] Importantly, it was the idea that *new* organs could be developed from 'use and circumstances' that Meade associated with Lamarck. This idea departed from the notion that the natural propensities of a species dictated what peculiarities could be transmitted once acquired. Meade was only recently graduated and hadn't yet begun his work on arachnology that would remain his special publishing domain for the rest of his life; it was Paget who had found him an opportunity to contribute to the *Penny Cyclopaedia*, and we can presume it was also Paget who directed Meade on how to handle the presentation of Lamarck's views on transmutation, a topic very important to the overall position of the *Penny Cyclopaedia* within the scientific views of the contributors, many of which were attached to the newly-established University of London. *The Penny Cyclopaedia* entry for Erasmus Darwin blamed his untenable theories on “the state of natural history in his day,” saying that “his errors were neither few nor unimportant.”[605] The fact that Darwin's

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603 R.H. Meade, 'Lamarck', *The Penny Cyclopaedia,* Volume 13 (1839), pp. 280-281.
604 Ibid., p. 281.
605 'Darwin, Erasmus', *The Penny Cyclopaedia,* Volume *8* (London 1837), p. 312.

untenable theories are left unstated, while Lamarck's are entered into in some detail before being refuted demonstrates the degree of importance Lamarck merited.

For his information, Meade didn't read Lamarck, but read instead French biographical dictionaries: he had *Biographie Hommes Vivants, Biographie Medicale,* and also *La Dictionaire des Sciences Medicales*.[606] As Corsi has argued, Lamarck's ideas – correctly or incorrectly presented – were primarily diffused via dictionaries, encyclopaedias, and other inexpensive serial publications.[607] Meade, as a young physician, was better informed about the ideas of Lamarck in 1839 than a good number of his peers. But like most other British medical writers that touched on Lamarck in the 1830s and 1840s, he both believed in the inheritance of acquired characteristics and rejected Lamarck's explanation of the origin of 'new organs.'

William Benjamin Carpenter

Before exploring how Carpenter used the inheritance of acquired characteristics to support his views on race, on temperance, and on the relationship of natural law to divine power, it is important to survey the disagreement over Carpenter's position as a religious conservative or heterodox radical. Historians that look at Carpenter's work in the 1870s and 1880s are more inclined to view him as a religious conservative, unwilling to embrace the full significance of evolution, while historians attentive to his earlier years portray a religious radical, positioned against Anglican and Oxbridge authority and aligned with dangerous ideas

[606] Meade (1839), p. 281.
[607] P. Corsi, 'Before Darwin: Transformist Concepts in European Natural History', *Journal of the History of Biology*, 38, no.1 (2005), pp. 67-83, p. 70; see also P. Corsi, *The Age of Lamarck: Evolutionary Theories in France, 1790-1830,* trans. J. Mandelbaum (Berkeley, 1988).

emanating from the continent. Dov Ospovat, in 1976, argued that Carpenter's reputation as an authority was nearly without its equal, and that as a result he was singularly responsible for the popularization of Von Baer in England.[608] Later historians revised this idea. For Adrian Desmond, Carpenter's early years were dominated by the 'Gower Street Geoffroyans', and the idea that the animal kingdom is founded on one type of organisation.[609] By the 1840s, Carpenter had found a harmony between his views on progressive development and his Unitarian faith that aided him in his opposition to "the Oxbridge clerisy."[610] The wider ramifications of this shift of power away from Oxbridge and towards the "Dissenting nouveau riche" promised increase wealth and fortunes for medical students that lacked connections. Here, for Desmond, Carpenter became embroiled in a conservative backlash, where 'civic propriety' took fright.[611] As evidence, Desmond cites the accusations of materialism in the early 1840s, and also Carpenter's efforts to have Herschel review the second edition of *Principles*.[612] His early years constituted, for Desmond, a "bourgeois assault on science and society."[613] Alison Winter was also interested in Carpenter's escape from charges of materialism, noting that Carpenter assembled patrons "into a de facto committee," publishing a series of supportive statements in a medical journal.[614] Carpenter, Winter suggests, had cause for concern that his patrons would regard his positions

608 D. Ospovat, 'The influence of Karl Ernst von Baer's Embryology, 1828-1859, *Journal of the History of Biology,* 9, no.1 (1976), pp. 1-28, p. 10.
609 Desmond (1989), pp.214-215.
610 Ibid., p. 216.
611 Ibid., p. 221.
612 Ibid., p. 221.
613 Ibid., p. 222.
614 A. Winter, Mesmerized: Powers of Mind in Victorian Britain, (London, 2000), p. 51.

'blasphemous.'[615] Winter's Carpenter is grouped with Southwood Smith, Robert Grant, Marshall Hall, and John Elliotson, forming a 'heterodox' scientific position in the face of Anglican authority.[616] James Secord, in *The Victorian Sensation,* maintains that Carpenter was a likely suspect for authorship of *Vestiges.*[617] Secord also borrows from Carpenter's associations with materialism, as well as Ada Lovelace, in order to position Carpenter as a figure challenging the various conservative powers of his era.

While Desmond and Winter both highlight the charges of atheism and materialism that Carpenter faced in his early years, it was only when the American physician Martyn Paine accused Carpenter of both materialism *and* plagiarism, that John Forbes, the editor of the *British and Foreign Review* at the time, wrote swiftly in Carpenter's defence.[618] The defences of Carpenter that were published took the charge of plagiarism more seriously than they did charges of materialism. While Carpenter stemmed from a rationalist family that was at theological odds with both the Anglican establishment and the emotionalism that constituted many other Dissenter's faith, Carpenter's significance and importance as a leader in the Unitarian community never faltered. He edited his late father's sermons (which were impressively subscribed).[619] His father had championed access to education,

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615 Ibid., p. 52.

616 A. Winter, 'The Construction of Orthodoxies and Heterodoxies in Early Victorian Life Sciences', in B. Lightman (ed.), Victorian Science in Context, (Chicago, 2008), p. 24.

617 J. Secord, Victorian Sensation (London, 2000), p.169.

618 See J. Forbes, 'From Dr. Forbes, Editor of the British and Foreign Medical Review, to Dr. W. B. Carpenter', The Medical Examiner, 4, no. 52 (December 25, 1841), p.830. See also J Jackson's defense of Carpenter from the same charges: J. Jackson, 'Drs. Carpenter and Paine,' The Boston Medical and Surgical Journal, 25 (January 5, 1842), p.348. Both focus upon the question of plagiarism as the most serious of issues.

619 L. Carpenter, Sermons on Practical Subjects, (Bristol, 1840). The volume was paid for by subscriptions, a common way of funding the publication of a religious text.

and William Carpenter continued this effort by working towards the establishment of Harris Manchester College, providing Unitarians with a place to study and train at Oxford.[620] The fact that anti-Dissenters viewed Carpenter in a negative light must be balanced by the fact that Carpenter remained a full, respected member of the religious community into which he had been born and educated.

Carpenter was able to maintain his commitments to Unitarian causes while making significant and important alliances within Britain's political and scientific elite. Once the tutor of Ada Lovelace's children, Carpenter would use his new connection to Lord Lovelace to secure membership of the Royal Society in 1844, his reputation at that time based largely on his publishing career – which in 1844 was still that of a compiler.[621] It was, in fact, *compiling* as a method of inquiry that made Carpenter so central to science in Britain. Like other medical men, Carpenter decided to produce a series of popular encyclopaedias. But he made the unusual decision that he would author the *entire seven volumes* on natural philosophy himself. In 1841, just as the second edition of his *Principles* was being published, Carpenter undertook a contract to produce a seven-volume 'Popular Cyclopaedia' for *The Society for the Promotion of Popular Instruction* (finishing the last instalment in 1847). John Forbes commented in his 1841 review of Carpenter's first instalment: "we know nothing of, and indeed never heard of, the Society by which this small volume is said to be published."[622] There is scant surviving material from

620 Lant Carpenter, on the coronation of Queen Victoria, gave a speech to Dissenters in Newcastle-Upon-Tyne, where he reaffirmed the Unitarian commitment to educational rights of Dissenters. See, "A discourse on Christian Patriotism" which advocated for the extension of science and universal means of education. (L. Carpenter, A Discourse on Christian Patriotism, (London: 1838), pp. 27-28.

621 Dep Lovelace-Byron. 169/127-8.

622 J. Forbes, 'Popular Cyclopaedia of Natural Science—Vegetable Physiology', *The British and Foreign Medical Review* no.12 (July-October 1841), p. 227.

the Society – we know that it published theological and philosophical treatises alongside Carpenter's work, and that it was criticized in the press occasionally for claiming – like SDUK – to make knowledge available to a wider selection of readers, and yet it preferred to publish large, heavy, expensively-bound volumes.[623] Nevertheless, Carpenter's *Cyclopaedias* were published in quarterly instalments, and thus followed (in basic structure) the same ideal of serialisation espoused by Thomas Knight.

As the physician and popular medical writer James Paget reflected in the 1880s, Carpenter's production of physiological treatises in the 1840s accompanied a key shift in the curriculum of medical schools in Britain, where physiology for the first time became a separate course of lectures.[624] But Carpenter's treatises enjoyed a far wider readership than that constrained by medical students: Darwin's heavily-annotated copy of the *Principles of General and Comparative Physiology* (1851) remains a key source in understanding the composition of his *Origin*, and Carpenter himself received a letter from the embryologist Von Baer that he had read Carpenter's principles while on holiday at the shores of the Caspian.[625] Churchill's publishing records show that he produced 1,000 copies with each edition of Carpenter's treatises and manuals, publishing a revised or new edition of each title in 1839, 1841, 1843, 1846, 1847, 1848, 1851, and 1854.[626] His treatise on the microscope (published in 1853) saw 3,000 copies printed – one of the highest in Churchill's records.[627] Carpenter was, with the exception of Robert Chambers,

623 'The Life of Luther', *The Westminster Review* no.34 (June-September 1840), p. 508.
624 See Paget's letter to Joseph Estlin Carpenter, quoted in W.B. Carpenter, *Nature and Man* (London 1886), pp. 64-65.
625 Ibid., p. 64
626 See MS 1393 / M8 / 45-210.
627 MS 1393/ M8 / 61.

arguably Churchill's best-selling author for the 1840s and 1850s. Carpenter's dedication to revising and revisiting his treatises made them a key source of authority, but they also come to serve as a record for Carpenter's own opinion on what information, and what anecdotal cases and animal stories, constituted knowledge and medical evidence.

Was Carpenter a radical, or a religious conservative who 'choked' on the idea of evolution, as Darwin commented infamously to Lyell?[628] The short answer is that Carpenter was opportunistic: the advancement of his career was his paramount concern, but he conceived of this career as both that of an eminent scientist *and* as an eminent Unitarian. While Unitarians were staunchly abolitionist, it was also an age of celebrity missionaries: Robert Moffat, David Livingstone, Hiram Bingham, were all active in the decades of Carpenter's early years, and their work necessitated public support that non-European nations, however physically and mentally inferior, were still inherently capable of adopting the Christian faith.[629] His father Lant Carpenter, espousing religious education for the poor, had argued in 1829 that "all the children of the human race shall be taught of the Lord."[630] Carpenter's family was one of the most visible and important families in the Unitarian faith, and the various siblings pursued their father's worldview: Russell Lant Carpenter worked with abolitionists in North America, Mary Carpenter founded ragged schools in Bristol and travelled to India to advocate for poverty relief and

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628 See for instance, David Hull's discussion of the infamous letter in: D. Hull, *Darwin and his Critics: the Reception of Darwin's Theory of Evolution by the Scientific Community* (Cambridge, Mass: 1973), p.87.

629 For discussion of Carpenter's abolitionist position, see D.C. Stange, *British Unitarians Against American Slavery, 1833-65,* (London, 1984), pp. 125-131.

630 L. Carpenter, *Sermons on Practical Subjects,* (London, 1840), p. 199.

education. Like Prichard before him, his views on heredity were never far from his responsibility to defending the unity of mankind.

But Carpenter was capable of changing his colours to suit his advancement. As he was writing his second edition of the *Principles* and his *Popular Cyclopaedias* on vegetable physiology and zoology, he was editing *The Vestiges of the Natural History of Creation* and using his familiarity with the doctrine of transmutation to interest Ada Lovelace in his scientific projects. About the time that he succeeded in gaining membership to the Royal Society due to the intercession of Lord Lovelace, Carpenter continued to present himself to Ada Lovelace as holding views similar to those espoused within the sensational book.[631] Carpenter went so far as to suggest that he would be willing to repeat Andrew Crosse's controversial experiments with Lovelace herself:

> I forgot to mention in my last letter, a book which I have been reading with much interest, and which Lady Byron tells me that you have got, – "Vestiges of the Natural History of Creation." I am reviewing it for Dr Forbes. The ideas are quite familiar to me, and I long ago expressed them in a general form. Some of the reasoning is loose and inconclusive; but I very much admire the tone and spirit of the book. It increases my desire to come at the bottom of the truth (if the well be not too deep) in regard to the Acarus Lerossii; by examining, physiologically + Zoologically, the history of its developments. If you could get such information and material from him, as would enable us to establish an Acarus-producing apparatus in our workshop, I think we shall do good service to science by such a series of observations.[632]

At this stage in his career, Carpenter had practical concerns about his capacities as an experimenter that made such suggestions more attractive. He owned a decent microscope and chemical apparatus, but lacked any electrical or galvanic

631 See Dep Lovelace-Byron /169/127-8 for his correspondence concerning his election to the Royal Society.

632 Dep Lovelace-Byron 169/222-223.

equipment.[633] Ada Lovelace did not indulge him in his suggestion, but the episode shows that while Carpenter was committed to his faith, he was also flexible in how he employed his medical and scientific authority to further his professional ambitions. Even 'radical' ideas, or blasphemous ideas, were put forward with the aim of increasing his station, not attacking the establishment.

Carpenter's first treatises and encyclopaedias, 1839-1847

Carpenter sought approval from two distinct sources: the medical and scientific establishments of Britain, and the Unitarian church's intellectual elites. His encyclopaedias and treatises addressed both audiences. The significance of his position as intellectual heir to his father, the eminent minister, educator and social reformer Lant Carpenter, weighed upon him. Carpenter's early publications were ambitious, yet also tainted by inaccuracies. Charles Knight in 1851 takes pains in his biography of Carpenter to note that, in the case of Carpenter's own 1939 *Principles*, "that there should be errors in detail could only be expected. It was a most remarkable production for a young man."[634] In 1885, the shortcomings of the work were represented as having originated from the fact that Carpenter had been forced to draw from 'books', and not from 'nature' – but such a view does not represent the execution of scientific works in the 1830s.[635] Certainly Carpenter felt concern in the years he was compiling his cyclopaedias that he was removed from the heart of scientific development. He lamented in 1842 to his newly-acquired friend Richard Owen that: "Living, as I do, so completely out of the way of knowing what is being done in science, except through ordinary journals. I am always uncertain if I am

633 See Dep Lovelace-Byron /169/229.
634 C. Knight (ed.), *The English Cyclopaedia,* Vol. 2, (London, 1851), p. 80.
635 J.E. Carpenter, 'A Memorial Sketch', *Nature And Man* (London, 1886), p. 33.

really working to any advantage, or if I am merely repeating what has already been done, and is generally known."[636] The presentation of himself as on the periphery of practice, doomed to repeat the work of others, hints at experimental work, but at this time Carpenter was unhappily working in medical jurisprudence in Bristol, and had just begun his work into the shells of molluscs that he would publish in 1844.[637]

The *Principles of Comparative Physiology* was first published in 1839, with new editions following in 1841 and 1851. According to John Churchill's records, *The Principles of Comparative Anatomy* was one of his best-selling and reliable works. Carpenter received £100 pounds for each edition, and the print-run of 1,000 copies was the largest after his editions of *Vestiges*.[638] In that long interval, Carpenter published numerous editions of his *Human Physiology* and also his *Student Manual*, works that clearly were produced by drawing from the same materials as his *Principles*. The *Principles* was one of Churchill's most-valued titles, and one that both extended his reputation as a medical publisher and held appeal for a readership beyond practicing doctors.[639] From its first edition, the treatise contained a section dedicated to the inheritance of acquired characteristics, and over the course of its revisions Carpenter regularly removed and replaced anecdotal evidence for the idea from his account. Carpenter borrowed freely from numerous points of authority: experimental evidence from his local nurseryman in Bristol, *The Library of Useful Knowledge's* edition on botany, the work of botanist William Herbert, and anecdotes from farmers in the Americas and in Britain all made their

636 W.B. Carpenter to R. Owen, 23 August, 1842. (Correspondence with Richard Owen and William Clift, held at the Natural History Museum Library and Archives), L OC62/2.
637 C. Knight (ed.), *English Cyclopaedia, Volume II* (London,1851), p. 80.
638 MS 1393 /M4-8/.
639 See MS1393 / MS 5/.

way into an evidence base that provided for what Carpenter thought in 1839 was a subject which "deserved more attention than it has yet received."[640] Carpenter saw that the idea of the inheritance of acquired characteristics could further his efforts to account for the different human races, but it jarred with his own work on orbitolites and foraminifera, as he saw no means by which the very striking variations in small marine life could meaningfully be viewed as acquired in response to the climate or conditions of the parent.

The first three editions of the *Principles* – 1839, 1841, and 1851 – begin with the same claim:

> And yet, amidst the constant change and succession of individuals, we observe the form and character first impressed upon each race by the Creator of all, uninterruptedly transmitted from parent to offspring through periods of indefinite duration. "One generation passeth away" – but "another cometh" – like it in structure, functions, habits, food, instincts, passions, and the limit of its existence.[641]

Here, Carpenter sought to satisfy his two audiences: Britain's scientific elite, and also his Unitarian family and intellectual community. Carpenter could affirm the divine origin of species and the coinciding of natural law with divine plan, but he also set out to explore the relationship of inheritance between generations. Following George Combe, Carpenter included a section dedicated to evidence in support of the inheritance of acquired characteristics. Carpenter was interested in modifications caused by external conditions that became hereditary: these included, for him, cultivated plants and domesticated animals as fields from which evidence could be gleaned. Transcending their disagreements over phrenology, Carpenter pointed to Combe and Prichard as supporting his view that *hybrids*,

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640 W.B Carpenter, *Principles of General and Comparative Physiology* (London, 1839), p. 418.

641 See W.B. Carpenter, *Principles of General and Comparative Physiology, (*London, 1839, 1841, 1851), Introduction / section 2.

mixed offspring of animals, plants, and even persons of different races, were the best adapted to their unique climates, and would come to dominate them both in nature and in politics.[642] What evidence could support such a statement at odds with the political and racial views of the day? In no small part, evidence for the inheritance of acquired characteristics: a case based on plant, animal, and human heredity, that would be accessible to all readers, already familiar with such cases that Carpenter vaguely alluded to.

From the plant realm, Carpenter cited the ability of gardeners to convert single flowers into doubles by the power of cultivation – a familiar argument that cultivation could induce transmittable new habits into varieties of plants.[643] He cited the obliteration of spines, prickles and thorns – but otherwise trusted his reader's familiarity with the gardening press of the day to support his claims. The case of dogs received similar faith – Carpenter maintained that the use demanded of domesticated dogs introduced hereditary improvements on the organs of hearing, smell, and sight.[644] Continuing, Carpenter also allowed that new modifications, of the kind advanced by Youatt, could also be found – shepherd's dogs, hunting pigs, and racing horses were all put forward as familiar cases where the inheritance of acquired habits could be argued for.[645] Breaking with Prichard, Carpenter even allowed that "cats deprived of their tails will often produce one or two tail-less kittens at each birth."[646] Such cases were contested by many, but by 1839 they had found renewed sympathy given the wider accumulation of evidence

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642 Carpenter (1839), p.417. Carpenter cites volume one of Prichard's *Researches into the Physical History of Mankind*, and chapter 5 of George Combe's *Constitution of Man*.

643 Ibid., p. 419.

644 Ibid., p. 421.

645 Ibid., p. 422.

646 Ibid., p. 422.

for the inheritance of acquired characteristics. Carpenter assumed his readership had a healthy familiarity with the accounts of hereditary injuries and ailments suffered by livestock and domesticated animals discussed in the agricultural press, and he expressed his support for the inheritance of acquired characteristics by appeal to these cases. Carpenter also borrowed from the travels of naturalist Francois Roulin, who had attested that over a period of generations, greyhounds imported to the high altitudes of Mexico from Europe had become acclimatised to the rarefied air.[647] These examples had trafficked in the periodical press for years before Carpenter's inclusion of them in his treatise. He clearly anticipated that his audience was familiar with the kinds of animal stories that are reproduced in agricultural and veterinary periodicals, when he wrote: "instances are on record in which dogs, that have been deprived of their tails by accident or design, have produced puppies with a similar deficiency."[648] The 'record' that made such instances public knowledge was the agricultural periodical press.

From an early point in his career, Carpenter looked to gardening magazines and botanical treatises for evidence on the nature of heredity. He also attended to the practices at his local plant nursery in Bristol, and he reports in the first edition of his *Principles* that the nurseryman at Durdham Down had demonstrated that three Orchideous plants previously regarded as belonging to distinct genera can be produced from the same parent.[649] Likewise, William Herbert's work on the *Amaryllis* (discussed in Chapter Two) became an important source for Carpenter's contention that climate and cultivation could introduce striking new

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[647] M. Roulin, 'The Real Del Monte Company'', *Annal des Sciences Naturale*, no.16. (1829), p.16
[648] Carpenter (1839), p. 422.
[649] Ibid., p. 415.

characteristics in a plant and yet fail to engender a hybrid that was capable of reproduction.[650] Carpenter's interest was always in finding evidence for the unity of the human species, and such cases all served to further the evidence that humans too might, despite their outward differences, stem from a common ancestor. He used Herbert's work on *Amaryllis* and accounts from nurserymen to argue that there was ample evidence to show that certain characteristics and peculiarities are restricted to 'particular localities', a claim that was important to him in explaining the relationship between race and climate.[651] He went so far as to suggest that just as the mixed offspring of animals and plants 'generally exceed in vigour', so too would intermarriage between Europeans and the indigenous populations of its colonies prove superior to either parent race.[652]

By the time Carpenter published his second edition of the *Principles* in 1841, 'new' evidence had found its way into his discussion of the inheritance of acquired characteristics. His son, Joseph Estlin Carpenter, would later recall the labours his father undertook in the 1840s and 1850s to revise and insert new materials into the numerous family of treatises he wrote for John Churchill.[653] In fact, Carpenter had become more confident in including some examples of the inheritance of acquired characteristics that he had been dubious of two years before. Carpenter read Thomas Knight's essay on hereditary instincts, and included new references to the examples Knight had put forward.[654] In particular, had read Alexander Walker's *Intermarriage*, and the cases and stories that Walker had included clearly struck

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650 Ibid., p. 417.
651 Ibid., p. 417.
652 Ibid., p. 417.
653 See J. E. Carpenter, 'A Memorial Sketch', *Nature and Man* (London 1886), pp. 62-63.
654 W.B. Carpenter (1841), p. 510.

Carpenter as worthy of report by himself. Walker had included an example from John Hancock, doctor and zoologist whose travels in South America produced communications that frequently provided material for the periodicals and popular encyclopaedias of the 1830s. Walker had instigated a correspondence with John Hancock from which he gained new stories and material for his *Intermarriage,* amongst which was the claim from Hancock that he had witnessed 'whitening' amongst slaves and African servants in the Americas and Europe, due to the effects of climate.[655] Walker had also included some of Delabere Pritchett Blaine's animal stories that demonstrated evidence that the mental state of the mother, when pregnant, could determine physical and behavioural traits of her offspring. Blaine had put these stories forward in his own treatises from the turn of the century, and they had been repeated by William Youatt in his own publications for SDUK and his periodical *The Veterinarian*.[656] Carpenter cited such cases as evidence that human instruction could be transmitted from parent to offspring in the animal case, and concluded that:

> No one, who has sufficient opportunity of observation, can doubt that the intellectual faculties, which have been developed by cultivation, are generally transmitted to the offspring in an improved state; so that the descendant of a line of educated ancestors will probably have a much higher capacity for instruction than the child that springs from an illiterate race.[657]

The significance of gardening and the rearing of domesticated animals to the question of the origin of the human races was not limited to Carpenter's side – a couple years after Carpenter's second edition of the *Principles* was released, Josiah

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655 A. Walker, *Intermarriage* (London, 1838), pp. 275-8.
656 See A Walker, *Intermarriage* (London, 1838), pp. 275-8. For Walker's sources, see D. B. Blaine *Canine Pathology (*London 1817), p. 46.
657 Carpenter (1841), pp. 511-512.

Nott delivered a series of lectures where he likened the "retrograde movement" of freed Africans towards barbarity to that of cultivated plants.[658]

James Prichard had provided a spiritual and professional inspiration for Carpenter from a young age, and he must have been familiar with Prichard's discussion of climate, circumstances, and varieties in the plant world.[659] Prichard had used the crab tree and its parentage of varieties of apple in order to explain the different races of human kind. Culture, Prichard concluded, could contribute to variation in the case of plants and trees. For Carpenter, nearly thirty years after Prichard's first publications on the question, new terminology and sources were available. In his appropriations of Prichard's ideas, Carpenter abandoned his mentor's early efforts to separate the inheritance of acquired characteristics from the effects of climate, cultivation, and civilisation. Carpenter became interested in what he termed 'permanent varieties', plants that had at one stage been changed in character by cultivation but which now remained as stable as 'real species.'[660] For Carpenter, both plant varieties and human varieties branch away from a common stock in accordance to the same natural laws. The science of classification, in the human case and the plant case was equally compromised. "Thus of the Willow, 71 species have been stated by one authority to exist in Britain," Carpenter explains, "whilst another reduces them to 29."[661] Such disagreements were often enumerated in the popular press. In 1839, following Loudon's publication of his *British Trees and Shrubs, The Edinburgh Review* tallied the various estimates from botanists on the

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658 See J. Nott, *Papers on Ethnology, Etc.* (New York, 1844), p. 40-50.
659 See J.C. Prichard, *Researches into the Physical History of Man* (London 1816), pp. 205-6
660 W.B. Carpenter, *Popular Cyclopaedia of Natural Science: Vegetable Physiology* (London, 1843), p. 303.
661 Ibid., pp. 303-4.

subject of the willow. Loudon counted 224, the botanist J.E. Smith 64, and John Hooker over 70.[662] The appetite of British readers for such detail requires its context. At stake was the question not only of how botany ought to proceed as a science, but also at stake was the Creation narrative that nature provided evidence for.

Carpenter's early experimental work

Carpenter was not only split between his desire to maintain a sure footing in Unitarian circles and Britain's scientific elite. He also presented different views of the operations of heredity depending on whether he was advancing his own work, or compiling evidence from others. Chance variation played an important place in this early work – one that he chose to downplay in later years, despite its relationship to his original research. In one of his first published papers, Carpenter had asserted that "everyone must perceive that the extended researches which are at present being carried on, both in zoology and botany (And these not confined to the existing epoch, but extending to past ages) are everyday contributing to fill up the links that before seemed deficient."[663] Carpenter subscribed to the belief, like many conchologists, that a natural group will vary by 'imperceptible gradations' into the next group.[664] During his efforts to establish a reputation (and an income) through the publication of encyclopaedias and treatises, Carpenter also worked on marine physiology. Shells, during this period of the development of natural philosophy, were the small change of the specimens that were traded and sold back

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662 'Loudon's British Trees and Shrubs', *The Edinburgh Review,* no.68-9, (July 1838), p. 212.

663 W.B. Carpenter, 'On unity of function in organized beings', *Edinburgh New Philosophical Journal,* 15 (July 1837), p. 6.

664 Ibid., p. 6.

and forth – Carpenter included a note at the end of his papers requesting submissions of shells from readers and collectors.[665]

All the same, Carpenter's ambitions were to contribute to larger questions than the classification of shells: he wanted his work to have consequences on larger debates over the nature of life. The microscope provided a tool by which Carpenter could identify homologies in shells and skeletal structures that had been overlooked or unseen by previous researchers. While rejecting the transmutationist views espoused by Lamarck, Carpenter was in alignment with Lamarck's position against the systematists, and he argued that microscopic study of the anatomy of shells and the skeletal remains of Echinodermata could anticipate conclusions reached through study of anatomy.[666] In 1843, Carpenter could make out details at 1/6000th of an inch, allowing him to perceive the structure of the minute tubes that composed the structure of shells and to put forward new classifications based on structural similarities alone. “I cannot but think that the value of the microscope as an instrument of geological research, must be at once evident from these statements. The genera Terebatula, Spirifer, and Producta may be at once distinguished from each other, and from all other shells, by the characters supplied by a fragment of shell, which a pin's head would cover.”[667] Carpenter's hope was that investigations into variations in marine life (he specialised later in orbitolites and foraminifera) would prove decisive on the question of how far the internal

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665 See W.B. Carpenter, 'General results of microscopic inquiries into the minute structure of the skeletons of mollusca, crustacea and echinodermata', *The Annals and Magazine of Natural History,* no.79 (December 1843), pp. 377-390.

666 Ibid., p. 386.

667 W.B. Carpenter, 'General results of microscopic inquiries into the minute structure of the skeletons of mollusca, crustacea and echinodermata', *The Annals and Magazine of Natural History,* no.79 (December 1843), pp. 377-390.

power of variation could account for the variety of species that populated the globe. Carpenter saw in the myriad variations of form that shells undergo the promise of a theory of heredity based upon internal variation, that had no teleological or direct relationship to environmental pressures. Such a view is most keenly expressed in his Fullerian geology lectures delivered in 1847.[668] As early as 1841 he held that: "the simpler the condition of any organism, the more susceptible it is of being modified in form and structure by causes external to itself."[669] Yet he never makes peace with such a view when discussing life that is larger and more complex than small marine sea creatures, and as I will show in the next section and the next chapter, the human case increasingly swayed Carpenter towards fully committing himself to the inheritance of acquired characteristics.

There are a number of biographical details that might help to explain why Carpenter did not base his views on heredity on those he derived from his experimental work. In the 1840s Carpenter was working as the editor of the *British and Foreign Medico-Chirurgical Review*, but he was also facing hostility from Unitarian ministers for rejecting the historical truth of the biblical miracles.[670] Carpenter had played an important role in liaison with the newly-established Harris Manchester College in the build-up to the Dissenter's Act of 1844, which conferred the rights of Unitarians to maintain their church properties in accordance with the same laws that protected Anglican churches, and while Carpenter's position within the scientific community of Britain was undoubtedly

668 William Benjamin Carpenter, "Swiney Lectures in Geology, 1847-8." Papers of Wiliam Benjamin Carpenter, British Library, London. Hereafter: BL Add MS / 1-21.
669 W.B. Carpenter, *Principles of General and Comparative Physiology* (London 1841), p. 169.
670 J.E. Carpenter, 'A Memorial Sketch', *Nature And Man* (London, 1886), p. 43.

important to him, so too was his position and reputation within the Unitarian communities he had helped to defend. In a letter to his mother in 1848, Carpenter wrote excitedly about the revolutions on the continent and also the new historical approaches to theology being produced in Germany. At the centre of his excitement, however, was his observation that in the uprisings on the continent "there has been nowhere any reaction against religion, as in the first French Revolution."[671] Carpenter was persuaded, at the close of the decade, that he was part of an intellectual revolution that far from rejecting religion, was placing it at the centre of scientific inquiry.

Race and Robert Bentley Todd's serialised encyclopaedias

By 1851, Carpenter's third edition of the *Principles* had removed all reference to Alexander Walker and John Hancock. His views on the human case had shifted; in part, as I will discuss in the next chapter, due to his increased involvement in the temperance movement. But also because, having remained quiet on the question of race through the 1830s and much of the 1840s, Carpenter began for the first time to weigh in on the question of the origin of the human races. The entries on race for his 1853 edition of *Human Physiology* have determined that adaptation to climate, coupled with the inheritance of acquired characteristics, are the mechanisms by which defining and new characteristics originate and are transmitted.[672] He first came to this position in 1849, where he determined, when speaking on the causes of racial variation in mankind, that *all* distinguishing characteristics, even those considered 'spontaneous' or 'chance' can be understood as being caused by the

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671 W.B. Carpenter to A. Carpenter, December 31st 1848. See J.E. Carpenter, 'A Memorial Sketch', *Nature And Man* (London, 1886), p. 45.

672 W.B. Carpenter, *Human Physiology* (London 1853), p. 1036.

climate or situation of the organism.[673] Crucially, Carpenter wanted the idea of *domestication,* what earlier figures had referred to as civilisation or cultivation, to be the cardinal feature of the climate or situation to which these chance variations could be identified.

Robert Bentley Todd

Robert Bentley Todd's *Cyclopaedia of Anatomy and Physiology,* published from 1835 to 1859, was intended to perform similar objects to the *Penny Cyclopaedia* – it was to be a cheap, serialized means by which "every practitioner and student of medicine" could obtain "the marrow of an anatomico-physiological library."[674] Composed entirely of British contributors, the cyclopaedia was published in instalments after the fashion of the *Penny Cyclopaedia* – and like the *Penny Cyclopaedia*, it soon fell into scheduling difficulties and criticisms from its subscribers.[675] It's first issue (letter A) needed to make a splash, and so Todd promoted it in part by including an illustrated article by Robert Grant on the Animal Kingdom. "The subject is admirably illustrated by a profusion of woodcuts," the editors of the *Dublin Journal* commented, " – so numerous indeed, that we tremble for those who are to bear the expense."[676] Despite Todd's ambitions, the medical community was not entirely convinced that such serial, alphabetized publications represented genuine utility. "Who could have thought it?" the editor asked, "--anus, aorta, arachnida, all in the same sheet. Twenty years ago sensible

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673 Carpenter, W.B. ‚Varieties of Mankind', in R.B. Todd, *The Cyclopaedia of Anatomy and Physiology,* 4, no.2 (London 1849), p. 1304.

674 'New Publications: Cyclopaedia of Anatomy and Physiology', *Edinburgh New Philosophical Journal,* 15 (1833) p. 403.

675 'Notices', *Provincial Medical Journal and Retrospect of the Medical Sciences,* no.5, 114 (Dec 3 1842), p. 197.

676 'Reviews', *Dublin Journal of Medical and Chemical Science,* no.8 (1842), p. 351.

men and good human anatomists shook with laughter at cat and dog anatomy, but what will they now say when the very spiders are torn from their peaceful dwellings among the undisturbed tomes of Hippocrates and Galen, to establish physiological truths or dispel errors."[677] Criticised for imitating the *Penny Cyclopaedia*, Todd distinguished the aims of his own cyclopaedia as aiming for a greater level of scientific achievement, yet as the editors of the *Provincial Medical Journal* maintained, "subscribers to works published in parts are at the mercy of publishers."[678] Its position within the medical world was complex – it served many ends and received criticism, but it also launched many publishing careers. Nicolaas Rupke points out that Richard Owen made "major contributions" to the cyclopaedia at the start of his work on marsupial and monotremes.[679]

As Richard Yeo has argued, encyclopaedias like those produced by Todd or Charles Knight were part of a larger effort to move away from the model of the individual 'compiler'.[680] For Yeo, Carpenter's own encyclopaedias followed an outdated model of scientific authority – the role of the 'editor', no longer amassing portfolios of material but instead organising contributions from leading thinkers and authorities, had come into its fore. Yet on the subject of heredity, the importance of compiling remained key. As a topic, heredity was also unique in that 'new information' rarely cast older animal stories or anecdotes into doubt: a problem facing encyclopaedists when they turned to other scientific topics.[681] Like Samuel Morton's collection of skulls in Philadelphia, Carpenter's efforts to gather

677 Ibid, p. 351.
678 Ibid, p. 351.
679 N. Rupke, *Richard Owen: Biology without Darwin* (London, 2009), p.255.
680 R. Yeo, *Encyclopaedic Visions: Scientific Dictionaries and Enlightenment Culture* (London, 2001), pp. 68-69.
681 Ibid., pp. 68-69.

all examples of the inheritance of acquired characteristics sought to win the day by force of accumulation.[682]

Carpenter's contribution of an article on the 'varieties of mankind' in 1849 came at a time when the *Cyclopaedia* had established its reputation as one of the key serialized publications in which important new work was being published. William Lawrence had contributed a similar article for Abraham Rees' *Encyclopaedia,* published in 1812.[683] Lawrence, a monogenist, had used his entry to gather evidence from anatomy, agriculture, botany, and travel literature to argue for the unity of the human species. Thirty years later, Carpenter's article brought many examples from agricultural and gardening press to bear as evidence that were not yet widely diffused by the time of Lawrence's contribution. The long illness and death of James Prichard in 1848 (to whom he was related by marriage) may have motivated him to place himself as the principle heir to Prichard's views and legacy on the question of race. Carpenter's increasing stability at the University of London may also have been a factor in his decision to write definitively on race.

Animal stories from the Zoological Society, during William Youatt's tenure at the zoo, found their way into Carpenter's consideration. In order to defend his suggestion that spontaneous variations could in fact be explained as adaptations to the influence of domestication, he included an anecdote from Thomas Bell about how domestication of two Australian dingoes had yielded, when bred, puppies with spots, when their parents had been uniformly brown.[684] He suggested that the

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682 See F. Schiller, *Paul Broca, Founder of French Anthropology* (Oxford, 1992), p.137.

683 W. Lawrence, 'On Man', *The Cyclopaedia: or, Universeral Dictionary of Arts, Sciences, and Literature,* no.22 (London 1812).

684 Ibid., pp.1305. See also T. Bell, *A History of British Quadrupeds, including the Cetacea* (London 1834), p.203. Thomas Bell viewed the dingo as a descendent of the wolf: William Youatt disagreed and cited his own experiences at the menagerie with wolves and dogs as evidence. See

same effect could explain the fact that William Herbert was able to raise primrose, polyanthus, cowslip and oxlip, all cultivated varieties, from the seeds of the same plant.[685] It was this very kind of arranging – placing breeding experiments from the Zoological Society menagerie alongside observations in plant cultivation and seed selection – that breathed new authority and consequence into belief in the inheritance of acquired characteristics. He went so far as to include suggestions abandoned by an earlier generation of monogenists that the physical variations in people and animals could be explained by direct appeal to the nature of the climate. "It is a curious and very significant fact," he explains, "that the sheep of the Cape of Good Hope, which are descended from the European stocks, should exhibit the same tendency to the accumulation of fat about the rump, as is seen in the human races indigenous to that region."[686] Carpenter was referring to Angola Sheep, and may have gained his opinion from reading William Youatt's discussion of the unusual sheep, or those of the colonist and farmer George Thompson.[687]

Such straightforward parallels between climate and physiognomy had fallen under criticism decades earlier. Louis Agassiz, who regularly argued that the human races did not vary in accordance with the climates in which they were discovered, wrote in the same year as Carpenter's essay that: "the intelligent influence of man himself, the object he seeks in the education of domesticated animals, the constant care bestowed by him upon them, have far more to do with the production and preservation of all these varieties than any influence of physical

W. Youatt, *The Dog* (London, 1846).

685 W.B. Carpenter (1849), p. 1305.

686 Ibid., p. 1312.

687 See W. Youatt, *Sheep* (London 1837) p.119-120; see also G. Thompson, *Travels and adventures in Southern Africa* (London 1827).

causes, acting independently of his intelligent agency."[688] Still, Carpenter persevered in arguing for climate. As he had in his *Human Physiology* and his *Comparative Physiology*, Carpenter went back to examples borrowed from Francois Roulin, Humphrey Davies, and Thomas Knight. He used every case and example to argue climate, cultivation, domestication and civilisation all behave in concert: they introduce modifications of habit and structure which become hereditary. He even, following William Youatt and Thomas Knight, continued to cite cases where animals had demonstrated an increasing aptitude to learn tricks and new habits across generations of instruction:

> In the horse as in the dog, we have evidence that the habits which are developed by human training may become, to a certain extent, hereditary. Thus, it is observed that the wild horse has no pace but the walk and the gallop; the trot, to which European horses are usually trained, is an acquired habit, yet it obviously 'comes naturally' to the colt of a domesticated breed.[689]

What was referred to as the 'educability of animals' had long been a favourite topic in agricultural scientific publications. In 1842, *Chamber's Journal* and *The Veterinarian* both ran long essays assembling numerous stories about dogs and horses of the kind to which Carpenter alludes.[690] "A race of animals, like a race of men, is civilisable," an anonymous contributor to *Chamber's Journal* claimed. "and we cannot doubt that the same softening influences which have produced the advanced nations of Europe have operated upon the animals existing in the same countries."[691] As early as the first edition of *Principles* (in 1839), Carpenter had drawn upon the widespread belief that educated and well-read parents transmitted

688 L. Agassiz, *The Diversity of Origins of the Human Races* (New York, 1850), p. 129.
689 Carpenter (1849), p.1314.
690 See 'Educability in Animals', *The Veterinarian,* no.15 (London 1842), pp. 478-484.
691 Ibid., p. 484.

their strengthened tendency to erudition to their offspring.[692] The educability of animals served to reinforce a belief that, prior to the statistical data from state educational institutions, provided a means by which this idea could be defended at the most general level.

Why did Carpenter wish to defend the idea that intellectual habits inform one's offspring? How did such a bias fit into his worldview? One influence may have come from his dealings with the Lovelace family. Finding it increasingly difficult to manage Ada Lovelace's children, Carpenter went so far as to claim that the eccentricities of their parents (and grandparents) had clearly affected their constitutions. Ada's own eccentricities, he explained, had been transmitted to her children. "That you are a peculiar – *very peculiar* – specimen of the feminine race," he wrote to her, "you are yourself aware."[693] In addition, as I will explore in the next chapter, Carpenter's sister, Mary Carpenter, was beginning in the 1850s to put forward her own views on poverty and human heredity, having a key influence on her brother. Despite the evidence he produced through his work on shells that argued for random variation that was not meaningfully associated with either climatic influence or the habits and behaviours of the parent, Carpenter continued to collect and diffuse evidence for the inheritance of acquired characteristics, until in a series of essays published in the 1870s he affirmed the idea as *the* mechanism by which heredity operates.

Later views

In the early 1870s, Carpenter had already handed over the task of editing and

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692 Carpenter (1839), pp. 422-423.
693 Dep Lovelace-Byron. 169/117.

revising his many treatises to other hands. He enjoyed success, but not to the degree he felt he ought. He told Herbert Spencer in correspondence in the 1850s that he was completely incapable of comprehending or appreciating philosophy – a less-than-polite way of indicating that he had no interest or intent in following Spencer's work.[694] Twenty years later and he found that many of his ideas were known by Spencer's name, and not his own. His published articles and writings show that he resented Herbert Spencer, Alexander Bain, Douglas Spalding, and others, both their fame and their attachment to the theory of the transmission for acquired characteristics, which he increasingly came to view as an idea that he had supported and popularized at its earliest inception. He undertook to write a series of articles for *The Contemporary Review*, including – in 1873 – a three-part essay on acquired characteristics that Darwin would pay particular attention to (not in the least because it included lengthy treatments of his own work). The purpose of this essay was not to present new ideas. Rather, it was to set the record straight for future historians – "I have no other motive than the suum cuique in making this reclamation."[695] Carpenter explains to his readers: "I do not consider that any advance has been made in our positive knowledge on this subject beyond the stage to which I had brought it twenty years ago."[696] In other words, the readers of Spencer, Bain, Spalding, and others, would do better to attend to his own work compiling and presenting the mechanisms at work in heredity than to read speculative philosophical discussions presently in vogue. At those points where Carpenter *had* to admit change over the years between 1853 and 1873 – which, for

694 Papers of Herbert Spencer. Senate House Library, University of London. 6/123.
695 W.B. Carpenter, 'On The Hereditary Transmission of Acquired Psychical Habits', *The Contemporary Review,* 21 (1873), pp. 295-315, p. 295.
696 Ibid., p. 300.

his readers, of course composed the impact of Darwin – Carpenter merely stated that: "The opinion I expressed twenty years ago, that the Hereditary Transmissibility of *acquired peculiarities* a good deal depends in each case upon the nearness of their relation to the *natural constitution* of the Race, seems in harmony with our present more extended views."[697] Rather than press that he had anticipated the theory of natural selection, or that he had been one of the earliest proponents for the idea that the variations we witness in the individuals that make up a race or species are the product of chance variation (and Carpenter could easily have staked his reputation on either of these claims) Carpenter picked out the theory of acquired characteristics as the cornerstone of his thought, his legacy.

The growing importance that the *human* case had on Carpenter's views on heredity, over the experimental work he had undertaken with orbitolites and foraminifera, is reflected in the role played by the transmission of acquired characteristics in his physiological text books and treatises. The 1864 edition of *Human Physiology* was expanded to *re-include* discussions of Alexander Walker and heredity – material that Carpenter had inserted and then removed into his treatises in the 1840s, but which now held new significance and importance to his thought.[698] Two years later, Carpenter adds a lengthy section to his *Human Physiology* treating on insanity – but again, the material that Carpenter here considers is material that he met largely as a young man twenty to thirty years earlier.[699] What had changed? Carpenter's interest in human heredity, in the wake of Darwin, has arguably taken on a new significance. The ancestry of human experience has gained

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697 Ibid., p. 314.

698 W.B. Carpenter, *Principles of Human Physiology,* 6th ed. (London, 1864), pp. 784-5.

699 W.B. Carpenter, *Principles of Human Physiology,* 7th ed. (London, 1866), pp. 625-628.

more consequence and importance than it held in the 1850s, when Carpenter was still invested in Richard Owen, and not Darwin, being the leading star of science in Britain. The same anecdotes that Carpenter employed in the 1840s still find employment in the 1870s. Where Coulson maintained the same views on heredity over the space of his time contributing to the SDUK *Penny Cyclopaedia*, Carpenter remained committed to the same family of animal stories and patient case studies for many decades more, to the point that he denied that any *new* understanding of heredity had been produced in the years between 1853 and 1873. The human case became his principal model. More specifically, the question of *mental* characteristics became his principal model, and he guarded his understanding of heredity with jealousy against new works by up-and-coming figures like Spalding, or (in his perspective) Herbert Spencer.

Conclusion

Physiology in Britain lagged behind Germany and France. But in the efforts to produce a British physiology by compilation, a literature that was uniquely suited to gathering and publishing stories relating to the inheritance of acquired characteristics was formed. This genre, as I show, stretched beyond physiology: geological and phrenological treatises, popular encyclopaedias, and serialised physiological encyclopaedias also made room for these anecdotes. Bushnan's vision of physiology as a *unifying* science, while phrased in soaring rhetoric, tells us also how physiological textbooks were written: they were repositories for anecdotes and ideas that were being put forward in the periodicals, medical journals, and cyclopaedias of their time. Physiology was compilation – but by no means less well-regarded for being so. In fact, volumes like *Principles* played a crucial role in isolating anecdotes and case studies as authenticated. In an article on 'Reflex Function of the Brain,' the author (a young Thomas Laycock) wanted to make a case for acquired instincts. He introduced his selection of cases by assuring the reader that he has not borrowed them from just anywhere: “many examples of acquired instincts are on record; several of the best authenticated are detailed by Dr Carpenter in his 'Principles of General and Comparative Physiology.'”[700] Darwin relied on medical and animal anecdotes from Carpenter's oeuvre throughout his own publishing career. But established medical authorities and geologists like Laycock and Darwin were by no means the only writers turning to Carpenter for anecdotes that carried authoritative weight. All manner of writers did. Carpenter included a discussion of a suspected case of telegony in his *Principles* – Stephen Goodale, agricultural secretary in the state of Maine, used this to support his belief in telegony in his (1861) *Principles of Breeding*.[701] Miles Manly, professor of agriculture in Massachusetts, relied upon examples of acquired instincts from Carpenter in writing his (1891) “Stock Breeding.”[702] In era when scientific works were produced out of other books, rather than 'drawn from nature', physiological treatises played a crucial role in establishing, for lack of a better word, what was true. Publication was inextricably linked to professional status: compilations like those produced by Carpenter were the resources from which this literature drew its examples and cases. In a sense, if we are looking for where 'nature' resided in the life sciences in the 19th century, it was not in the physical world where we might

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700 T. Laycock, 'On the reflex action of the brain', *The British and Foreign Medical Review,* no.19 (1845), pp. 298-311.

701 S. Goodale, *The Principles of Breeding, or, Glimpses at the Physiological Laws Involved* (Boston, 1861), p. 51.

702 M. Manly, *Stock Breeding,* (London, 1891).

expect, but rather produced within physiological treatises and encyclopaedias. As Stephen Jay Gould maintained, nature does not yet exist at the moment of observation: 'nature' is the final product of scientific endeavour.[703] Compiling was, I have argued here, a crucial means by which the production of nature continued and progressed.

The rise of this kind of physiological writing intersected with changes in the religious content of medical writing.[704] Both Augstein and Jenkins have argued that Prichard's *Researches* fell out of favour in Britain due to its religious nature after the 1840s.[705] Historians of religion, meanwhile, have taken a different view, beginning with denominations and communities that were more amenable to receiving scientific ideas. Michael Watts, in *The Dissenters*, portrayed Unitarians as theologically well-placed to accept the more daring ideas emerging from geology and physiology.[706] For Watts, the Unitarian faith's rejection of biblical literalism, and of the Fall, yielded a religious community more able to accept new scientific ideas.[707] Still, Augstein and Jenkins would not be the only historians to argue that there was a movement *away* from physiological treatises that maintained religious elements. I have argued here that while some authors were moving away from religious inclusion, others were moving towards it: Carpenter's works were

703 See S.J. Gould, *The Mismeasure of Man*, (New York: 1981).

704 As Christopher Lawrence has argued, the establishment of 19th century medical institutions in Britain was accompanied by a string of controversies emerging from the friction between medical literature and divinity. See C. Lawrence, *Medicine in the Making of Modern Britain, 1700-1920*, (London 2006), p. 1941.

705 H.F. Augstein, 'Prichard, James Cowles (1786–1848)', *Oxford Dictionary of National Biography*, (Oxford, 2004); see also Jenkins (2015), p. 459.

706 M. Watts, *The Dissenters* (London, 2015), pp. 11-14.

707 Ibid., p.14. See also M.P. Wauck, *Religion, reason, responsibility: James Martineau and the transformation of theological radicalism in Victorian Britain, 1830--1900*. (Phd Dissertation, Rice University, 2007).

becoming increasingly inclusive of ideas that provided a better fit for his rationalist Unitarian faith. Carpenter's physiological textbook, while quickly heralded as an authoritative work on the state of the art, was by no means unique – physiological handbooks and textbooks were written by numerous doctors and publishers in this era both in Britain and America, and the scope of physiology included everything from philosophical treatises on natural forces, hygiene, basic chemistry, anatomy, geology, physics – and, of course, natural theology, where most authors, like Carpenter, took care to make it clear to the reader what ought and ought not be understood by the discussions contained within the text. While Anne Digby viewed this era of physiological writing as only yielding slow improvements in the practice of medicine, practicing doctors were by no means the only consumers of this literature: physiological treatises were read by natural historians, by theologians, and also by the emerging base of lay readers that publishers like John Churchill began to count upon in making their publications a success.

As I will argue in the next chapter, Carpenter's interest in the inheritance of acquired characteristics grew as he became more aligned with his sister's work as a social reformer, and also with the temperance movement. But the increasing confidence that he places in the inheritance of acquired characteristics across his publishing career also bears testament to the fortunes of the idea: where Carpenter, in the 1830s and 1840s, did not advance one view of heredity over another, by the 1850s and 1860s Carpenter had come to place increasing confidence and importance on the inheritance of acquired characteristics, despite the significance of his own research in foraminifera that lent itself to the primacy of chance variation. This shift does not only mirror Carpenter's personal beliefs: more importantly, it mirrors

Carpenter's assessment of his peers and his readers. The inheritance of acquired characteristics was becoming increasingly entrenched in medical thought, particularly concerning insanity, mental diseases, and alcoholism (as I discuss in the next chapter). Despite his reputation as a 'radical' of the 1830s, Carpenter rarely used his physiological treatises to wage war on what he regarded as widespread doctrine.

The context in which these early physiological treatises were produced and sold was of pivotal importance to the fortunes of the inheritance of acquired characteristics. If a flourishing experimental science had established itself in Britain at an earlier point, the process of compiling might have given way to other forms of organisation. *The Penny Cyclopaedia* provides a glimpse into how, as the 1830s and 1840s progressed, the primacy of the inheritance of acquired characteristics in explaining the origins of illness remained key to the medical entries, despite numerous authors contributing the entries. A culture of knowledge that prioritised legitimate anecdotes and stories in the communication of ideas about heredity fuelled the appearance of stories, collected occasionally from sources decades old, into the works of Carpenter and others. Very often the same stories repeated themselves, and not as many of the cases and stories reported in agricultural, gardening, and phrenological magazines made their way into these early treatises as Charles Darwin would later employ. As many historians of Darwin have commented, Darwin was uniquely adventurous in plumbing agricultural and gardening magazines for cases and evidence. But the Baconian process of compiling and arranging these stories had been developed decades before the appearance of Darwin's *Origin* or *Variation*.

Chapter Five: Temperance literature and the inheritance of acquired characteristics

Introduction

In the preceding chapters, I have maintained that the tie between the inheritance of acquired characteristics and a religious worldview was important. Focusing on how this idea of heredity was presented as part of a Christian understanding of nature by some authorities helps us to understand how it became a scientific truth in the eyes of the wider public. It also helps us to understand how the narratives and stories that were used as evidence in support of the idea drew upon ideas already familiar to the wider public. In this final chapter, I consider temperance and social reform literature, with an aim to showing how scientific and religious authorities utilised the inheritance of acquired characteristics to present the moral dangers of alcohol. Following Charles Taylor's conception of religious society, I have argued through this thesis that the inheritance of acquired characteristics preserved a way of viewing nature that was compatible with Christian ideas of sin, inheritance, and duty. Whether or not a scientific authority held personal faith, by espousing the inheritance of acquired characteristics, they maintained a language and terminology that drew upon familiar and widely-held understandings of the inheritance of sin. W.A.F. Browne probably did not have any faith or interest in practicing religion; but his views on the moral dangers of alcohol and the inheritance of immoral living were indistinguishable from those of Christian phrenologists that did, a fact important to understanding how the inheritance of acquired characteristics came to enjoy such prominence and universal appeal.

In this chapter, I follow the importance of one idea that gained increasing acceptance within the medical, phrenological, and temperance communities: this idea was that alcohol inflamed or damaged the brain of the drinker, and that this impairment in the brain of the drinker was subsequently transmitted to the offspring. This focus on the brain lent a new means of legitimacy and authority to many phrenologists who were otherwise in a perpetual state of losing respect among the medical and scientific community. As the demand for scientific opinion on the dangers of alcohol grew, the views of phrenologists found new life and new demand. Many asylum reports and physiological treatises published in the early 19th century doubled as temperance literature; and temperance pamphlets and treatises were the means by which many of the stories and anecdotes gathered by figures like Carpenter continued their life within the medical and popular press.

The history of the temperance movement is vast and wide-ranging. As James Nicholls has argued, in 1834 the idea that the State would ban all drinking was inconceivable; but by 1854 it was becoming more tenable.[708] For Nicholls, the history of temperance in these key decades is of an evangelical social reform that shifted away from a focus on spirits and towards total abstinence.[709] My treatment of temperance in this chapter is constrained to the contributions made by authorities I have already discussed in this thesis to the temperance movement, as these contributions tend to be overlooked both by historians of the temperance movement and also by historians of science and medicine. Brian Harrison's (1971) *Drink and the Victorians* has been followed by numerous works that analyse the

708 Nicholls (2009), pp. 109-11.
709 Nicholls (2009), p. 98.

social and religious context of temperance.[710] The pamphlets, sermons, and medical authorities that I discuss here are familiar to this literature: however, this literature has largely overlooked how the temperance movement provided an ideal means of diffusion and popularisation of ideas of heredity, particularly the inheritance of acquired characteristics. At the same time, temperance has received less attention than it deserves from historians of phrenology and heredity. John Van Wyhe makes no mention of temperance in his work on phrenology.[711] Muller-Wille and Rheinberger omit any discussion of temperance in their *Cultural History of Heredity*.[712] Adrian Desmond noted that some of the authorities discussed in *The Politics of Evolution* promoted temperance, but no consideration of temperance emerges from these biographical details.[713] Despite the dedication of *Chamber's Edinburgh Journal* to the temperance cause, James Secord includes no discussion of temperance in his book *Victorian Sensation.*[714] There are exceptions to this trend. As Daniel Pick observed, alcohol was one of the principal toxins that medical writers in France and Britain began to cite in their discussions of degeneration.[715] Still, Pick made no real mention of the temperance movement in his *Faces of Degeneration.* In *The Politics of Alcohol,* Nicholls focuses on the question of freedom in the 19th century, framing the temperance movement in a wider question

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710 B. Harrison, *Drink and the Victorians*, (London, 1971). See: S. Barrows, & R. Room (eds)., *Drinkng; Behaviour and Belief in Modern History,* (Berkeley, 1991). See also: J.S. Blocker, *American Temperance Movements: Cycles of Reform,* (Boston: 1989). The WCTU (Women's Christian Temperance Union) has also been the subject of much study. See I.R. Tyrrell, *Woman's World/Woman's Empire: The Woman's Christian Temperance Union in International Perspective,* (Chapel Hill NC, 1991).

711 See van Whye (2004).

712 See Muller-Wille & Rheinberger (2012).

713 See Desmond (1989).

714 See Secord (2000).

715 D. Pick, *Faces of Degeneration: A European Disorder, C.1848-1918* (London 1986), p. 50.

about the freedom to damage one's own body.[716] However, Nicholls includes no consideration of phrenology's relationship to the temperance movement. This chapter seeks to both explore the phrenological commitments and writings of authorities like William Carpenter, W.A.F. Browne and others already discussed in this thesis, with an aim to understanding temperance as an under-appreciated means by which the inheritance of acquired characteristics became a familiar and scientific idea to British and American readers. I also argue that the importance of temperance to the idea of the inheritance of acquired characteristics is integral to understanding its relationship to secularisation. Namely, this understanding of heredity, as it developed in medicine, agriculture, and gardening, was amenable to religious uses and already-established Christian views of the family, society, and reproduction.

While teetotalism was a popular position, eminent physicians defended both the right to drink and the benefits of alcohol. Robert Bentley Todd, who died of cirrhosis of the liver, claimed as late as the 1850s that alcohol was – in addition to its degenerative effects – a nutrient of the nervous system. In this chapter, I look first at phrenological writers and their early contributions to temperance writing. I then examine the temperance views of William and Mary Carpenter, and use these views as a means of further understanding how Carpenter came to increase the importance of the inheritance of acquired characteristics in his physiological work, even as his experimental work pushed him in the opposite direction.

Inflammation of the brain and inheritance

In the summer of 1843, in the Town Hall of Suffolk, around 700 people attended a

[716] Nicholls (2009), pp. 106-107.

debate between the outspoken temperance advocate and physiologist Frederic Richard Lees, debated a surgeon named William Jefferson over whether or not there were scientific reasons to abstain from spirits.[717] The debate spanned the deleterious effects of alcohol on all parts of the human body, but when it came to the subject of the brain, Lees noted that alcohol inflames the brain. And "inflammation of the organ, when it is acute, is usually attended by furious delirium, and other indications of high cerebral excitement."[718] The association of alcohol with delirium, or unnatural excitement of the brain, was by no means new. In his article on hereditary insanity, W.A.F. Browne had argued that "the drunkard injures and enfeebles his own nervous system, and entails mental disease upon his family."[719] James Cowles Prichard cited alcohol as the primary cause of insanity amongst the lower classes in Britain, writing in his 1837 *Treatise*: "we may observe that, among the physical agents which give rise to madness, there is none more influential than intemperance and the habitual use of ardent spirits. A very considerable proportion of lunatics in the lowest classes of society in some countries owe their disease to this habit."[720]

Lees, who would go on to be one of the most prolific authors on the subject of intemperance in 19th century Britain, was one of numerous physiologists and writers that used public interest in the effects and dangers of alcohol to popularise theories of degeneration and heredity that asylum physicians were developing in

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717 See the account of the debate in F.R. Lees, *Scientific Teetotalism*: *Appendices to the Illustrated History of Alcohol,* (London, 1843), p.7 For further information on Lees, see Judith Pitney's (1970) dissertation: *Frederic Richard Lees, The Teetotal Philosopher*. (PhD Dissertation, University of Wisconsin, Madison, 1970).

718 Lees (1843), Appendix C, pp. xxvii.

719 Browne (1841), p. 227.

720 J.C. Prichard, *A Treatise on Insanity* (London, 1837), p.121.

studying their own patients. Crucially, however, its negative effect was not viewed as resulting from damage it inflicted upon the reproductive cells or the foetus. Rather, the danger was that the changes wrought by alcohol on the body of the parent would be transmitted to the offspring, via the inheritance of acquired characteristics. Thus, a generation whose madness might be viewed as resulting from physical or accidental causes, would, if allowed to breed, produce a generation that was prone to mental disease by hereditary causes. Temperance advocates like Isa Craig, editing *The English Women's Journal* relied in part on asylum statistics to reinforce their claims that alcohol ought to be viewed as a key element in the formulation of 'unsanitary conditions' out of which mental disorders could be traced. Isa Craig chose to reprint Lord Ashley's 1843 speech "On the Moral and Religious Education of the Working Classes," which drew explicitly from the statistical tables of Esquirol, Poole, Browne, and numerous others. Ashley contended in the speech:

> We are really doing something to restore our paupers to a sanitary condition of body and mind, to enable them to do what sane men and women are able to do, take care of themselves. Bodily disease is readily enough traced to bad sanitary conditions in these days, and it is not difficult to trace mental disorder, and even incapacity, to the same source, while much physical disease can readily be referred to unsanitary mental conditions.[721]

There was an important social context for the increasing concern over alcohol and its link to insanity. Alcohol consumption in Britain – in the 1830s and 1840s – *was* declining after a rise in spirit consumption from 1825.[722] But the perception of unusually high consumption remained a point of embarrassment for the medical

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721 See the reproduction of Lord Ashley's essay in C.A. Lacey, *Barbara Leigh Smith Bodichon and the Langham Place Group, (*London, 2013), pp. 315-316.

722 See discussion in J. Nicholls, *The Politics of Alcohol* (Manchester, 2009), pp. 98-99.

and scientific community of Britain, and there were by no means any clear ideas as to how depleted the human stock of a nation could become through widespread abuse. Prichard pointed out repeatedly that intemperance was rarely cited in France as a cause of insanity, while it filled the statistical tables and anecdotal reports emerging from British asylums.[723] America began establishing asylums that solely treated alcoholism before any such institutions emerged in Britain.[724] Popular writers observed that the success of temperance movements in countries like America was strengthened by the fact that, unlike in Britain, women were not found to drink in taverns and bars.[725] A concern that industrial workers would spend increased wages on alcohol, rather than on improving their material conditions, coloured many of the debates over wages.[726]

In 1846, when the World's Temperance Convention convened in London, visiting judges from Liverpool, York and Salisbury presented their belief that intemperance was responsible for four fifths of the crime committed in Britain.[727] The idea that consumption of spirits was responsible for crime became one of increasing sophistication in Britain, with doctors even arguing that the intemperance of parents and grandparents could be responsible for the crimes

723 J.C. Prichard, A Treatise on Insanity and other disorders affecting the mind (London, 1837), p. 246.

724 W.B. Carpenter, Temperance and Teetotalism: an Inquiry into the effects of alcoholic drinks on the human system, (Glasgow 1849). pp. 43f. Hutcheson in Glasgow was particularly impressed by the progressive view of Americans in separating alcoholics from the other inmates within Asylums.

725 “The Americans have done more in their day and generation towards the banishing of this curse from amongst them, than any other nation.” See: 'Sketches of Every Day Life in America. No.III Intemperance', The Mirror of Literature, Amusement and Instruction, 35 (1841), p. 136.

726 Harrison (1971). See also Nicholls (2009). Social class has also been discussed by M. Thomson, 'The wages of sin', in W.F. Bynum, R. Porter, M. Shepherd (eds), The Anatomy of Madness, vol. 3, (London 1988), p. 321.

727 'Proceedings of the World's Temperance Convention', The British and Foreign Medical Review, no.24 (October 1847), p. 517.

committed by an otherwise temperate individual.

Phrenologists had long been interested in the potential effects of intemperance on the organs of the brain. Orson Fowler, like his British peers, recognised that intemperance did not seem to result in any enlargement of any areas of the brain.[728] But where Fowler hoped to account for the changes in the constitution through appeal to derangement of behaviour, his American peers thought in terms of the enlargement of exercised areas of the brain. American phrenologist Jacob Forman thought that intemperate men had enlarged sociality.[729] James Grimes, a contemporary of Forman's, thought that alimentiveness was increased.[730] Charles Caldwell, for whom salt was "the only admissible condiment," maintained that all stimulants placed appetite and passion over morality and intellect.[731] In Britain, a similar interest from phrenologists focused upon the idea that alcohol enlarged the different faculties of the brain. As discussed in Chapter Three, W.A.F. Browne, during his tenure at Montrose Asylum, had treated the son of an alcoholic whose hemispheres were unequal in size.[732] Browne had cited 'a single glass of spirits' as causing the onset of his 'incoherent madness.' The implication that Browne draws from the case was that the alcoholic consumption of the father had transmitted a structural change to the brain of his son, enlarging some areas while leaving others untouched.

As Margaret Thompson observed in her (1988) article, the Scottish (and the

728 O. S. Fowler, Fowler's Practical Phrenology (New York, 1840), p. 38.
729 J.G. Forman, Elements of Phrenology applied to the Human Character (Cincinatti, 1844), p. 24.
730 J.S. Grimes, A New System of Phrenology (Buffalo, 1839), p. 154.
731 C. Caldwell, 'Thoughts on the Pathology, Prevention and Treatment of Intemperance, as a Mental Derangement', *The Transylvanian Journal of Medicine and the Associate Sciences* (July-September, 1839).
732 W.A.F. Browne, 'Hereditary Tendency To Insanity', *The Phrenological Journal,* 14 (1841).

English) medical opinion was divided over whether or not alcoholism was a mental disease.[733] Her focus on the Scottish asylum doctor Clouston particularly highlights the common dilemma faced by many asylum doctors of the era, in deciding whether or not intemperance was a symptom or a cause of the mental disease suffered by the patient.[734] Browne, Thurnam, Poole, Prichard and Carpenter – including numerous others – all addressed this question at some point in their studies on madness. Yet despite the numerous teetotal asylum surgeons and superintendents that published in Britain and America and the high stakes of the controversy, beer remained a common foodstuff within the 19th century asylum. As Niall McCrae explored in his (2004) article, asylums depended upon the agricultural labour of their patients, and this was rewarded with beer as was expected by the social class of many of the patients.[735] Teetotal advocates were not only struggling against social practices, but also the systemic role that the production and consumption of beer within asylums themselves. While superintendent at Laverstock House and editor of *The Medical Times and Gazette*, John Bushnan published a pamphlet entitled *Burton and its bitter beer*, in which he argued vociferously against the teetotallers on the question of the harms posed by alcohol to the nervous system.[736] Bushnan, arguing against Carpenter's tremendously influential pamphlet advocating teetotalism (considered below), appealed to the fact that "the use of alcoholic drinks is essentially mixed up with

733 M. Thomson, 'The wages of sin', in W.F. Bynum, R. Porter, M. Shepherd (eds), *The Anatomy of Madness, vol.* 3, (London 1988), p. 321.

734 Ibid., p. 321.

735 N. McCrae, 'The beer ration in Victorian asylums', *The Journal of the History of Psychiatry* no.15:2 (2004), pp. 155-175.

736 J. S. Bushnan, *Burton and its bitter beer* (London 1853).

man's past history."[737] In other words, the need for occasional stimulants was not a threat to civilisation and society, but in fact part of its structure. Numerous physicians still speculated as to whether alcohol, given its power to stimulate the nervous system, might also provide a key nutrient to its development.[738] But professional opinion was fast converging around the idea that consumption of alcohol – in any quantity – damaged the brain, and that this damage became hereditary, dooming generations of a family to mental disease.

Temperance, madness, and the *Encyclopaedia Britannica*

At the start of the 19th century, physicians were split over the question as to whether intemperance was a symptom of mental disease or its cause. As the century progressed, those that believed it was the cause of mental disease became increasingly the more vocal of the two groups: a fact that makes sense considering that the temperance movement demanded medical evidence that drinking damaged health, not that it was a symptom of a prior impairment or disease. Despite remaining a theological movement, the shift away from the moral view to one that gave priority to physical causes can be traced between the 7th and 8th editions of the *Encyclopaedia Britannica*, where the 7th edition featured an article on 'Mental Disease' penned by Richard Poole in 1839, only to be replaced by one written by David Skae in 1859. As I discussed in Chapter Three, Richard Poole was a Christian phrenologist who rejected the inheritance of acquired characteristics and prioritised instead the belief that moral sickness, as it progressed, would lead to the

737 Ibid., p. 27. See also T. S. Clouston, *Clinical Lectures on Mental Diseases* (Philadelphia, 1884), p. 312.

738 'Proceedings of the World's Temperance Convention', *The British and Foreign Medical Review,* no.24 (October 1847), p. 526.

physical damage of the brain. In this position, he followed the German physiologist Johann Heinroth's views that "moral depravity [is] the essential cause of insanity."[739] His contribution to the 7th edition of the *Encyclopaedia Britannica* on mental disease not only endorsed Heinroth's system, but it traced the malady to the son of Adam, and dwelt extensively on biblical examples.[740] He traced "moral depravity" as the essential cause of insanity. To quote: "the change of structure [in the brain] is often an effect or incidental consequence of insanity, not its cause."[741] Hence, when Poole wrote on the subject of insanity, intemperance and the law, he preferred the belief that mental illness precedes habitual intemperance, rather than vice-versa.[742] Problems on the mental side lead to the structural differences morbid anatomists see on the physical side after death.[743] Poole cautioned that he did recognise there were cases were insanity arose through no moral fault of the individual – after all, if the nervous system is a mixture of vital and physical properties, it must be admitted that accidents to the physical side can cause insanity. But Poole clearly anticipated that such cases were in the minority.

Poole's views, while respected, were becoming outdated; the 1860 edition of

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739 R. Poole, 'Mental Diseases', *Encyclopaedia Britannica,* 7th Edition, 14 (London, 1842), p. 584.

740 Ibid., p. 579.

741 R. Poole, *Memoranda Regarding the Royal Lunatic Asylum, Infirmary and Dispensary of Montrose,* (London: 1841), p. 583.

742 See his discussion in "Remarks on the Plea of Insanity." "The habit of drinking to excess is, in many instances, the consequence of or an attendant on real mental disorder, arising from other and very different circumstances." (R. Poole, 'Remarks on the Plea of Insanity', *Journal of Psychological Medicine and Mental Pathology,* 8 (1861), p. 425).

743 We can learn about insanity by studying these changes, but in doing so we can't address the causes of madness. Poole was very intrigued by the physiologist Tiedemann's studies of 'monsters' or children born with physical defects. Tiedemann's observation was that irregularities in the spine or nervous system usually predicted deformities in the limbs or organs. This constituted evidence in Poole's eyes that the nervous system was the point at which vital properties mixed with the physical properties of the body, and that interruption of the nervous system meant that the vital principle could not communicate with the body. (Poole (1839), pp. 581-2).

the *Encyclopaedia Britannica* replaced Poole's essay with a new entry authored by Edinburgh physician David Skae, who prioritised physical causes and also gave more importance to hereditary factors.[744] Skae was more nuanced in his feelings on the dangers of alcohol; as McCrae observes, he thought the beer brewed at Ayr Asylum 'feeble'.[745] However, Skae was influenced by the French alienist Morel, whose views on the hereditary nature of insanity included the transmission of any or all mental diseases acquired through habit of drinking.[746] Opposing Poole[747], Skae declared in a paper read to an audience of lawyers at the Royal College of Surgeons in 1861 that "insanity is a *disease* of the *brain,* affecting the *mind.*"[748] Skae viewed the abuse of spirits as not only the greatest cause of insanity in Britain, but he also viewed the transmission of pathological traits acquired by the intemperate parent as second only to inbreeding in hereditary causes of insanity.[749] In his 1858 lecture on dipsomania, Skae revealed that he classified instances of dipsomania as hereditary in situations where a close relative suffered *any* form of mental illness: "Of the [dipsomaniac] females, this hereditary taint was found to exist in 10 out of 20. One had a brother insane; one a mother half-witted: one had two cousins who

744 D. Skae, 'Mental Diseases.' *Encyclopaedia Britannica.* 8th ed, Volume 14, (1859 / 1860), pp.529 for his discussion of hereditary causes. See also M. Barfoot, 'David Skae: Resident Asylum Physician', *Medical History,* no.53, 4 (2009), pp. 469-488.

745 McCrae (2004), p. 159.

746 J. Reinarz and R. Wynter, 'The Spirit of Medicine: The Use of Alcohol in Nineteenth Century Medical Practice', in B. Schmidt-Haberkamp (ed.), *Drink in the Eighteenth and Nineteenth Centuries* (London 2014), pp. 127-140, p. 137.

747 While Barfoot has argued in his (2009) that Skae was decidedly anti-phrenology, the importance that he placed upon hereditary factors brings his work closer to that of W.A.F. Browne than Poole's. Indeed, Skae liked Browne and used Browne's name when addressing non-physicians in order to ally his own thoughts with the famed alienist. Skae does this, for instance, in his 1861 address on the Legal Relations of Insanity. Ibid., p. 3.

748 D. Skae, 'The Legal Relations of Insanity', *Edinburgh Medical and Surgical Journal* (April, 1861), p. 7.

749 Skae (1859/1860), p. 535.

died of intemperance [...]"[750] And so on. The article (most likely by chance), was even published alongside Brown-Sequard's study on the transmission of epilepsy cause by lesions to the nervous system of guinea pigs, a landmark moment in the history of experiments conducted on use-inheritance.[751] If, in the 1840s, the *Encyclopaedia Britannica's* account of insanity and hereditary factors was indifferent to the question posed by Baillarger, by 1860 it had officially endorsed his view of heredity. Temperance had moved away from Poole's theology of moral failing and towards the ideas of his fellow phrenologists. I explore this transition in the next section.

Phrenology, temperance, and religion

In this section, I turn to the temperance writings of phrenologists in Britain and America. As I show, the focus on the idea that alcohol inflamed the brain, or phrenological organs of the brain, and that these changes became hereditary, was one that became increasingly important in phrenological / temperance literature, although it was not an important element in the very earliest works by figures like Robert Macnish (discussed below). From the 1820s onwards, temperance was an important topic for Scottish phrenologists, as well as their American counterparts. While Christian phrenologists split from Combe in 1828, this never had any substantial impact on the willingness of non-phrenologists and religious authorities to borrow from phrenological works in defence of temperance.

Robert Macnish, at the age of 24, presented his thesis to the Faculty of

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750 D. Skae, 'On Dipsomania', *The Journal of Psychological Medicine and Mental Pathology,* no.11 (1858), p. 354.

751 E. Brown-Sequard, 'Physiology and Pathology of the Nervous System', *The Journal of Psychological Medicine and Mental Pathology,* no.11 (1858), Supplement, pp. i-xvi.

Physicians and Surgeons of Glasgow on the physiological effects of drunkenness.[752] Like many Scottish medical students of the 1820s, Macnish was excited by the science of phrenology. He heard Gall lecture in Paris, and boasted to friends in Britain of the close connections he enjoyed to the phrenologist. Once he had found success with his essay on drunkenness, he expanded it in future editions, following common practice to ensure readership and authority on his subject.[753] Macnish's *Anatomy of Drunkenness* was an early work that set out the phrenological commitments to the temperance cause, borrowing from the account of the transmission of acquired habits that Macnish had found in the writings of Combe and Gall. Macnish, a poet and romantic, included references to genius and ecstatic states that later temperance authors would not recognise as part of the movement; and while he affirmed that intemperance was a hereditary illness that could be acquired and then transmitted to offspring, his views were different on this score than those of other phrenologists that would come after him.[754] For Macnish, alcohol was linked to sterility, and in cases where male drinkers could father children, these would be found (Macnish suggested) to be "puny and emaciated."[755] Macnish used this to support the number of children that die in infancy in London; yet his views on sterility were interestingly not repeated by many that wrote on intemperance who followed him. The preference for an account of hereditary intemperance that focused upon the drinker injuring his or her brain, and this injury to the brain being then transmitted to offspring, was far more common, as I

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752 A short biography of Robert Macnish is provided in R. Macnish, & D.M. Moir, *The Modern Pythagorean: A series of Tales, Essays, and Sketches*, 2 vols, (London, 1838).
753 Ibid., p. 13.
754 R. Macnish, *The Anatomy of Drunkenness* (London 1836), p. 16.
755 Ibid., p. 118.

will show below.

Macnish died of consumption in 1837, but by then the genre of phrenological temperance writing had expanded in size and scope, with lectures and pamphlets being produced by many of the common contributors to *The Phrenological Magazine*. Charles Caldwell, in America, was one of the most influential, writing on the topic of intemperance in 1832, and drawing from his experience at the Kentucky Lunatic Asylum in Lexington. For Caldwell, the cause of temperance provided a means of redeeming phrenology from the attacks made on him by his peers, as it so clearly evidenced the inheritance of diseased organs of the brain.[756] It also helped him to forge ties with the evangelical and religious authorities in America, that held tremendous influence during the 1830s and 1840s.[757] Caldwell's influential 1832 pamphlet had set out arguments that were already familiar to phrenological communities in Britain and America: from his experience within the Kentucky Lunatic Asylum, Caldwell was convinced that alcohol stimulated the organ of alimentiveness, the seat of the mania that he observed in his patients. “In hundreds and thousands of cases,” Caldwell wrote, “parents having had children born to them while their habits were temperate, have become afterwards, intemperate, and had other children subsequently born. In such cases, it is a matter of notoriety, that the younger children have become addicted to the practice of intoxication much more frequently than the elder.”[758] It was a claim familiar in phrenological literature, despite the difficulties that Caldwell's peers in Britain had in compiling authoritative cases in support of it.

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756 C. Caldwell, 'On Intemperance', *Transylvania Journal of Medicine and the Associate Sciences*, 5 (July-September 1832), pp. 309-350, pp. 349-50.

757 See R.J. Cowardine, *Evangelicals and Politics in Antebellum America* (New Haven, 1993).

758 Caldwell (1832), pp. 309-350, pp. 341-2.

Phrenology – both Christian and Combean – remained an important constituent of the temperance movement, providing cases, evidence, and medical explanation that fuelled decades of pamphlets, sermons, and treatises. Underlying this vast discourse was the anxiety for the unborn: the threat that any amount of drinking would not only harm the drinker, but that those deficits would be transmitted to any future offspring. Levison, in a lecture delivered at a Mechanics Institution, criticised parents who"...think they have acted with parental solicitude for their offspring, because they leave them money, although at the same time they bequeath to them bodies liable to many painful diseases, and minds ill-balanced, or naturally weak."[759] Dedicated to the founder of the Mechanic Institution, Levison viewed his lecture as part of the work of social reform. The epitaph of the volume, "The sins of the fathers (physical and moral) shall be visited upon the children" provided a medical revision of the biblical passage most frequently cited in relationship to the inheritance of acquired characteristics.[760] For Levison, the temperance cause would be fought not only from the pulpit, but from the Mechanic's Institute and phrenological lectures. By helping themselves to familiar religious imagery, phrenology could emerge as *the* scientific paradigm that best accounted for the familiar case of intemperance in families. Levison even found phrenological explanations to account for cases where an intemperate father gave birth to temperate children, just so that every eventuality had been covered. Levison cited his medical experience of witnessing intemperance in the older children of drinkers more frequently than in the younger children. Levison argued that heavy drinking can so exhaust the constitution that the constitution of the

759 J.L. Levison, *Lecture on the Hereditary Tendency of Drunkenness, (*London 1839), p. 42.
760 Ibid., p. 42.

temperate mother is transmitted in its place. “We have a solution to this apparent anomaly,” he wrote, “by the fact that the elder children were begotten during the highly excited state of the organs *of gustativeness*, which, after years of over-stimulation, became easily excited, indicating a feeble state of the organ.”[761] A constitution so weakened that it could not even transmit the stamp of the father's sins was, apparently, a worse failing than fathering intemperate children. It is important to note that even in this explanation, Levison did not suggest that alcohol damaged the reproductive cells of the father: it damaged instead his constitution, and that damage was communicated to the reproductive cells and only then informed the condition of the offspring. If it was the damage to the reproductive cells that mattered, then much of the testimony from phrenology would have been useless. Still, Levison viewed teetotalism as the solution to much of poverty not because it improved the lives of those living, but because it was the surest means of eliminating the hereditary compulsion towards intoxication.

Temperance magazines provided a space within which sermons on the evils of alcohol could be communicated more widely. Within these sermons, the willingness to adopt medical opinion is quickly evidenced. Reverend Peabody cautioned to his American parish that “...you invite to your houses, the worthy and promising children of intemperate parents, in whose veins there lurks so deep an hereditary taint, that nothing short of entire abstinence can hold them back from a drunkard's grave.”[762] In Britain, a Reverend Antliff labelled intemperance 'an hereditary evil', arguing that medical and religious position had come to a point of

[761] Levison, (1839), p. 43.
[762] M. Peabody, 'Duty of abandoning Wine on festive and social occasions', *Journal of the American Temperance Union*, no.5-8, p. 125.

agreement on the dangers posed by alcohol to future generations. “Now it has come under our personal cognizance, that children do sometimes inherit their parents' fondness for strong drink, and, very generally, their parents' diseases.”[763] In his sermon, Rev. Antliff maintained that “scientific facts prove to us, that while we are bringing disease or debility upon ourselves, through intemperance, we are also transmitting to generations yet unborn the melancholy fruit of our crimes.”[764] Such sermons became common-place and popular within the temperance movement, and their familiarity to congregations must have been tremendous. In the temperance pulpit, the inheritance of acquired characteristics found its fastest and largest means of diffusion to the public, and the medical cases collected by phrenologists like Levison, Browne, and opponents to phrenology like Carpenter and Prichard, helped to underscore this vast discourse.

With the establishment of prize essays, temperance societies were able to generate further medical contributions in advance of their cause. Alongside the efforts of phrenologists, other medical authorities arose, compiling cases and evidence that, while not always convincing to medical and scientific authorities, enjoyed widespread discussion and diffusion within temperance societies. Having won the prize essay competition put forward by the *New British and Foreign Temperance Society*, Ralph Grindrod's *Bacchus,* published in 1839, borrowed heavily from Caldwell's earlier writings and continued to promote the medical-religious understanding that “by habits of intemperance, parents not only degrade and ruin *themselves*, but transmit the elements of like degradation and ruin to their

763 W. Antliff, 'Intemperance an Hereditary Evil', *The New British and Foreign Temperance Magazine*, 1 (January 1841), pp. 239-240.
764 Ibid., p. 240.

posterity."[765] Kostas Makras argues that texts like that of physician Grindrod's *Bacchus* were not only popular, but helped to establish a common perception that drink-induced madness was a form of insanity.[766] It was Grindrod's book that communicated to the wider temperance community the anecdote from a Dr. Kirk of Greenock, who claimed that in the brain of a deceased man he discovered whiskey, pooled in a cavity of the organ: "when we smelled it, the odour of the whiskey was distinctly visible; and when we applied the candle to a portion in a spoon, it actually burned blue."[767] Ten years later, Carpenter's own prize essay on temperance would give the movement what it had long desired: a lengthy treatment on the question of the injurious nature of alcohol that brought with it the authority of Britain's medical elite. But the sensational imagery of Grindrod's *Bacchus* retained its place as a source of medical knowledge and fact, being cited for decades by various temperance writers in Britain and America.

While *The Phrenological Journal* had finally exhausted its utility to its adherents in 1847, temperance remained a means by which the ideas and doctrines of phrenology remained significant and important to a wider audience: so much so that even figures like Carpenter were willing to borrow from the cases and examples put forward by phrenologists. The American phrenologist O.S. Fowler, in 1841, first published his successful and widely-reprinted *Phrenology Versus Intemperance*, which by 1847 had gone into its 24th printing.[768] While interest in

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765 R.B. Grindrod, *Bacchus, an essay on intemperance* (London, 1839), p. 318.

766 K. Mastras, 'The Poison that Upsets my Reason: Men, Madness and Drunkenness in the Victorian Period', in S. Trowbridge, (ed.), *Insanity and the Lunatic Asylum in the 19th Century,* (London: 2015), pp. 135-149, pp. 139-140.

767 Grindrod (1839), p. 332.

768 O.S. Fowler, *Phrenology versus Intemperance: A Lecture on Temperance Considered Physiologically and Phrenologically*, (Philadelphia, 1841); see also Fowler, O.S. *Temperance, founded on Phrenology and Physiology,* (New York,1846).

phrenology as a science ebbed, its relationship to temperance continued to provide it with relevance and appeal to a wider audience, and it was successful in maintaining that intemperate families provided evidence of its basic tenets and the inheritance of acquired characteristics. Fowler, as many had before him, explained to his readers: "such are the physical relations existing between parents and their offspring, that the drinking propensity of the former, is liable, if not almost certain, to be transmitted to the latter."[769] Each phrenologist found a different phrenological means of accounting for what organs of the mind alcohol affected; for Fowler, alcohol had a global effect upon animal organs of the brain, stimulating these at the cost of the intellectual faculties. Hence, "The children of drinkers are never as intellectual or moral as those of others, are usually dull scholars, quarrelsome and vicious, and the pests of society."[770] Fowler, like his predecessors, failed to deliver a thorough account of the medical evidence of his day – however, with Prince Albert's announcement of a temperance prize essay, figures like Carpenter had a new reason to take part in turning attention to the evidence phrenologists and asylum doctors had generated in defence of temperance.

Carpenter's prize essay: the physiology of temperance

Phrenologists were keen to make themselves useful to temperance; but their authority only extended so far. And at the close of the 1840s, William Benjamin Carpenter published his Prize Essay on temperance, a work that would remain a key source of legitimacy for many years to come. As I discussed in the last chapter, the 1840s saw Carpenter not only aspiring to a position of authority in the medical

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769 Fowler (1846), p. 31.
770 Ibid., p. 17.

and scientific community, but also seeking to retain his position as a prominent member of the Unitarian community, despite his questioning the historical nature of the biblical miracles. L.S. Jacyna (1980, 1984) places important weight upon Carpenter's deterministic theology, and regards this as integral to understanding how he viewed physiology as through and through a question of material causation.[771] In his dissertation on British Unitarian leaders, “Carpenter established professionalizing scientists as a *via media* between scientific radicals, who hoped to democratize scientific institutions, and the aristocratic gentlemen who maintained that scientists were born with innate gifts...Like the new school of Unitarianism's elevated conception of the professionally trained minister, who could use his training in high ideals to attract and guide those around him, Carpenter envisioned scientists as professionals who had trained their natural instincts to a high level and, therefore, could influence and guide others.”[772] Wauck characterises Carpenter as primarily motivated by a wider movement within Unitarianism of the 1830s – this was a period of massive enfranchisement for the sect, despite occasional setbacks (such as the loss of a position in Edinburgh due to William Benjamin Carpenter's faith in the 1840s), and one in which Unitarians took advantage of their increasing academic and political power to call for “free theological inquiry.” For Wauck, the growing agnosticism of the age makes figures like Carpenter appear more closely allied to a secular worldview than they actually were. As his sister, Mary Carpenter, with funds from Lady Byron, founded her first ragged school in Bristol, Carpenter began to put his compiled cases to work on a new topic:

771 L.S. Jacyna, 'The Physiology of Mind, the Unity of Nature, and the Moral Order in Victorian Thought', *British Journal for the History of Science,* 14 (1981), pp. 109–132.
772 Wauck (2007), p. 236.

temperance.

In 1849, John Forbes, the former editor of the *British and Foreign Medical Review*, and court physician to Prince Albert, announced a prize essay worth 100 guineas on the subject of the physiological effects of alcohol consumption.[773] Such competitions were part of the early strategies of the temperance movement, and they extended to all educational levels. Carpenter's essay was to be the most influential and celebrated; but *The National Temperance Society* ran essay competitions for working men, and published the winning essays.[774] Carpenter, then in charge of curriculum at the University of London, became one of the key texts in the 1850s onwards for sources on authoritative anecdotes related to the adverse effects of intemperance. Having received permission to dedicate his essay to Prince Albert, the pamphlet garnered much of the reputation that Albert himself established through the 1840s and 1850s of being a friend to both social reform and scientific progress.

Carpenter established intemperance as a disease, certainly – but he also compiled the most pertinent medical knowledge about intemperance in one place, establishing that the inheritance of acquired characteristics played a key role in the pathological heredity of intemperance. Prior to Carpenter's prize essay, it was by no means universally accepted that intemperance was hereditary. In the *Boston Medical Journal*, a physician, sceptical of the over-reliance on acquired characteristics, wrote in 1835: "most children who are brought up with their

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773 See W.B. Carpenter, *Temperance and Teetotalism: an Inquiry into the effects of alcoholic drinks on the human system. (*Glasgow, 1849), pp. i-iv.

774 S. Couling, *The History of the Temperance Movement in Britain and Ireland* (London 1860), p.201; see also M. Spears and C. Hunt, *The Principles and Practice of Total Abstinence; The Necessity, Practicability, and Value of Total Absinstance* (London 1851).

parents, easily contract their habits. Often the drunkard's or the libertine's child should accuse the parent less for transmitting gout and enervation, than for setting examples of the vices from which these effects result."[775] Thus, while there were voices insisting within the wider medical realm that it was beyond question that acquired habits informed the constitutions of offspring, there remained doubt and scepticism over whether or not such explanations were necessary for understanding the nature of nervous disorders (as intemperance was then viewed).

True to Carpenter's style and approach, the essay is a compilation of medical views, statistical tables, physiological observations, and case studies from the last thirty-odd years of medical and physiological literature. What is remarkable is the extensive reliance upon data from asylums to underscore Carpenter's main argument: – that the *structural changes* caused by habitual drinking are transmitted to one's offspring. From Samuel Gridley Howe, one of several influential American asylum doctors that linked idiocy to moral crimes[776], Carpenter borrowed a table purporting to show that out of a sample of 300 idiots, 145 were the offspring of habitual drunkards.[777] Carpenter's use of the table made it a handy, oft-quoted fact that would circulate for decades until, as McDonagh observes, Henry Maudsley dismissed it as unfounded in 1867.[778] Carpenter speculated that in many of the cases labelled 'hereditary' in the published statistical tables from asylums, that alcohol had been an exciting cause – and he viewed this

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775 'Evidences of insanity', *Boston Medical and Surgical Journal,* 10, no.23 (January 14, 1835). pp. 361-372, pp. 368-9.

776 P. McDonagh, *Idiocy: a cultural history,* (Liverpool, 2008), p. 262.

777 Carpenter, (1849), p. 43.

778 George Shuttleworth, at the Royal Albert Asylum in 1877, would finally deliver a sustained reinvestigation as to whether or not it was sustainable that intemperance was linked to hereditary idiocy. See McDonagh (2008), p. 264.

as further likely when he considered that pauper asylums contained many more intemperate patients than did those that catered to the higher classes.[779] But the table is interesting because, despite Carpenter's insistence that the hereditary nature of intemperance followed the pattern of scrofula or gout, it clearly is importantly different. Parents with tubercular constitutions will have children also prone to tuberculosis. Parents with gout will have children prone to gout. But Carpenter, in 1849, affirms that asylums in Britain and America have adequately demonstrated that intemperate parents can give birth to children suffering not only from idiocy, but also epilepsy, mania, monomania, melancholia, and so on. “There can be no doubt,” Carpenter argued, “that those who have weakened and disordered the nutrition of the brain by habitual Intemperance, are far more liable than others to be strongly affected by those causes, moral or physical, to which the Mental Derangement is more immediately attributable.”[780]

In order to argue that intemperance led to hereditary insanity, Carpenter borrowed heavily from *The Phrenological Journal* and the asylum reports of William Hutcheson, superintendent of Glasgow Asylum and head of the local phrenological committee in that city.[781] While Carpenter remained dubious and sceptical about the tenets of phrenology, his views on human heredity were ultimately built out of the evidence that filled the pages of the Phrenological Association's journal. As Delorme (2014) observes, Carpenter begins his career in Edinburgh by entering the debate over phrenology as a sceptic; yet he does not do so without writing to Combe to express just how much he has personally learned and benefitted from

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779 Carpenter (1849), p. 44-45.

780 Carpenter, (1849), p. 31

781 See 'List of Members of the Phrenological Association, at 19th September 1840', *The Phrenological Journal,* 13 (1841), pp. 119-23.

phrenological literature.[782] Carpenter had read Browne's essays on hereditary insanity, and was struck by the asylum surgeon's observation of intemperance and the family.[783] Carpenter was particularly interested in Browne's observation that three of his patients at Dumfries in 1841, owed their "unhealthy action of the brain" and idiocy to intemperate parents.[784] Carpenter held the opinion of his fellow doctors in high esteem, and the anecdotal cases where eccentricities or madness were transmitted within families weighed more heavily on his opinions about heredity than his experimental work with marine life. Carpenter used *The Phrenological Journal* as a source for his anecdotes and medical cases, from which he drew a similarly vague case concerning two parents that were only mildly intemperate, and yet bore a child that was 'completely idiotic.'[785] In this particular instance, Carpenter cannot even name the physician or doctor that reported the case – he relies entirely upon the authority of the *Journal* itself (a surprising choice for Carpenter).

The phrenologist William Hutcheson also heavily influenced Carpenter's views, particularly because his investigations into poverty and intemperance in Glasgow mirrored many of the views of his sister, Mary Carpenter. Within his asylum reports, Hutcheson prefers the diagnosis of *oinomania*. The term passed through a short-lived vogue in the 1840s and 1850s in Britain and America, designating as one anonymous contributor to Carpenter's *Medico-Chirurgical Review* put it: "an irresistible impulse to indulge in intoxicating substances,

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782 S. Delorme. "Physiology of Psychic Powers? William Carpenter and the debate over spiritualism in Victorian Britain." *Studies in History and Philosophy of Biological and Biomedical Sciences,* 48, 2014, pp. 57-66, p. 59.

783 Carpenter (1849), p. 52.

784 Ibid., p. 52.

785 Ibid., p. 53.

whenever and wherever they can be procured."[786] For Hutcheson, *oinomania* is identified not by the state of constant intoxication, but by an irresistible impulse to drink.[787] Hutcheson claims to have observed such a failure of the will to control the impulse to drink in both accidental and hereditary cases – but regards the latter as incurable. While noting that fevers can induce a temporary form of *oinomania*, Hutcheson views the hereditary cases as "the most incurable form of the malady." Most interestingly, he suggests that from his own experience the ailment has been transmitted from parents that are *not* intemperate themselves, but suffer from some other form of mental disease. "It is frequently hereditary – being derived from a parent predisposed to insanity or addicted to intemperance."[788] It was the asylum that provided this window into the workings of heredity – and statistical analysis that (more often than not) made true the observation that intemperance was but one possible form that mental illness could take in the offspring of an epileptic, or a monomaniac. The public interest in the temperance cause and the dangers of alcohol brought these theories on heredity into mainstream discussion, popularising them and presenting them as having been derived from statistical analysis.

Carpenter makes only one reference to Mary Carpenter as a source of authority on a scientific question, and this has to do with developmental psychology in the 1876 (1877) edition of *Human Physiology*. But William Benjamin

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786 'A case of Oinomania', *The American Journal of Insanity,* no.7-8 (July 1851), p.5; original article 'On the Medico-Legal Relations of Insanity', *British and Foreign Medico-Chirurgical Review* (July, 1850), pp. 180-203.

787 W. Hutcheson, *The 28th Annual Report of the Directors of the Glasgow Royal Asylum for Lunatics* (Glasgow 1842), p. 40.

788 Ibid., pp 39-44; quoted in Carpenter, W.B. *Temperance and Teetotalism: an Inquiry into the effects of alcoholic drinks on the human system* (Glasgow, 1849), pp. 37-8.

Carpenter's attitudes towards heredity and society were identical to those of his sister – a point that comes out in revisiting his prize essay. In his enumeration of diseases brought on by alcohol, Mary Carpenter's brother William includes 'criminal conduct.'[789] He tells us that alcohol brings with it a “habitual excitement of the lower propensities,” which entails a degradation of the moral constitution.[790] Like his sister Mary, he cites the lack of effective education for the masses as one of the primary causes of the proliferation of criminal habits.[791] But unlike his sister, William Benjamin had no direct familiarity with prisons, he made only several documented visits to asylums, and he had no experience of education outside of his work as a tutor and his role as registrar in the University of London. His views on heredity, environment and crime he inherited from his family and the intersection of temperance advocacy and religious charity His views on temperance only *increase* his conviction that acquired characteristics are transmitted as time passes. This was an era when many physiologists and physicians viewed public health and society as in effect carrying out a vast experiment, from which the natural historian could observe the workings of environment on heredity. Carpenter was just such a physiologist, and he viewed alcohol as the most thoroughly-understood experiment underway in our society:

> Now all these 'nervine stimulants' further agree in this, that while they excite or misdirect the Automatic activity of the mind, they weaken the controlling power of the Will; and this is exactly the condition which, intensified and fixed into permanence, constitutes Insanity. We have a far larger experience of the results of habitual Alcoholic excess, than we have in regard to any other 'nervine stimulant;' and all such experience is decidedly in favour of the *hereditary transmission* of that acquired perversion of the normal

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789 Carpenter (1849), p. 46.
790 Ibid., p. 47.
791 Ibid., p. 147.

nutrition of the nervous system which it has induced.[792]

To 'pervert' normal nutrition simply meant that alcohol was not a foodstuff. Carpenter divided the human diet into two categories: foods that were digested in such a way to fuel the regenerative process, and foods that were in fact not food at all; but toxins and poisons that the body could not use to regenerate, but instead had to eject or rid itself of. Alcohol – just such a poison, introduced changes to the nervous system. It was not, as Robert Bentley Todd charged, the nutrition of the nervous system – a fact that his death of cirrhosis after a lifetime of heavy drinking must have highlighted in Carpenter's eyes. Alcohol consumption produced a hereditary taint, a general deformity in the functioning of the nervous system transmittable to one's offspring as medicine, asylum data, and criminal statistics all freely attested.

Mary Carpenter's views on temperance, poverty and heredity

Carpenter placed a strong emphasis in his Prize Essay on the inheritance of the defects to the brain and body caused by intemperance. His sister, the social reformer Mary Carpenter, shared this view. As she wrote in her first book on criminals, making her case for the need of reform: "there is one stamp of degradation on them all, which must make them an hereditary burden to the country, if the young children are not early trained to a different course of life."[793] But it represented a strong break from the views of their father Lant Carpenter, a product of the Enlightenment who rejected the idea of inborn characteristics and knowledge. Both Mary and William Benjamin would come to uphold that the

792 Ibid., p. 299.

793 M. Carpenter, *Reformatory Schools, for the children of the perishing and dangerous classes,* (London, 1851/1853), p. 72.

behaviour of children was in a large part determined by heredity, and that many of the behaviours of children can be understood as 'instinctive' owing to the habits of their parents. Their father, in his contributions to *Rees' Cyclopaedia* in 1813 and 1814, argued against the view that the human mind contained instincts. Considering whether a child's feelings for its mother are instinctual, Lant decided that even these were the result of early association:

> The term instinct, when applied to the human mind, we regard as a mere appeal to ignorance; but we have no doubt that the early associated feelings towards a parent, particularly towards a mother, may exist long after the direct recollection of her has altogether ceased, and that the sight of her, after long absence, may produce strong emotions in the mental frame, though the memory furnishes no distinct traces of her visible appearance, her tones, &c; and though no communication is made respecting her relationship to the individual.[794]

Nonetheless, Lant Carpenter viewed individuals as having what he termed "intellectual peculiarities," properties of the mind that were not the product of experience – and he thought that the recognition of these should be taken into consideration when planning a child's education.[795] *Rees'* was expensive, and Lant Carpenter later reissued his contributions in the form of a book in 1824 in the hopes that he could make his views more widely accessible. But William Benjamin, who began publishing at the height of the influence that inexpensive and serialized encyclopaedias would hold in Britain, would use his own encyclopaedias and treatises to confront and argue against this view of the human mind. As an educator himself, Carpenter broke faith with his father's outlook very early on, in his distrust (and arguably, his distaste) for Ada Lovelace's children, Carpenter

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794 L. Carpenter. *Principles of Education: Intellectual, Moral and Physical,* (London, 1820), p. 175.
795 Ibid., pp. ix.

departed from his father's views on education to indicate that his efforts as a tutor would be limited by the material he had to work with. As he explained to her, heredity had already been at work in shaping them.[796] This early test of his *practical* views on the influence heredity holds in the development of children would be reinforced over time, as the significance of the inheritance of acquired peculiarities came to increasingly take precedence in determining his world outlook. But his views on the significance and importance of heredity would develop over time, as I explore below.

When Mary Carpenter died in 1877, Dudley Ryder (Lord Sandon) called for parliament to join him in marking her death, and said that she had shaped his own views on education (for better or worse).[797] And her younger brother, William Benjamin Carpenter, finally added a footnote to a passage in his *Principles of Human Physiology* owing that on the question of voluntary will in childhood, "My information on this subject is mainly derived from my sister, Mary Carpenter; than whom no one can speak with a greater weight of authority."[798] It is the only mention of Mary Carpenter in all of his published writings: inviting either the deduction that his older sister Mary had profoundly little influence on his thought, or that he chose to omit (even conceal) the influence she had on his views. I think a good case can be made for the latter view, although I hope here only to show that Mary Carpenter's views on the physiology of heredity perfectly coincide with those of her brother.

796 Dep Lovelace-Byron. 169/57.

797 See Hansard 1803-2005, HC Jul 10 1877 vol 166 cc1204-77, Stable url:: http://hansard.millbanksystems.com/commons/1877/jul/10/class-iv-education-science-and-art#column_1081, accessed July 21st 2017.

798 Carpenter reuses this passage at several points in his work – the earliest incidence is to be found in his *Principles of Mental Physiology*. 4th ed. 1876 (but published in 1877).

Lant Carpenter, besides being one of the most prominent Unitarian ministers of his era, also ran the school where James Martineau studied alongside his daughter Mary Carpenter. Lant Carpenter's children included two ministers (Russell and Philip, the latter of which was also an important conchologist), a physiologist (William Benjamin) and a social reformer and temperance advocate (Mary). These four children all viewed their religious, intellectual, and social roles as woven of one fabric, and they borrowed freely from one-another in their writings. Mary Carpenter, relied on her brother Philip's knowledge of geology and marine life in her presentation of geology to the students at her ragged schools:

> I had taken to my class on the preceding week some specimens of ferns, neatly gummed on white paper; they were much struck with their beauty, but none knew what they were [...] This time I took a piece of coal-shale, with impressions of ferns, to show them. [...] I then told each to examine the specimen, and tell me what he thought it was. One gave so bright a smile that I saw he knew; none of the others could tell; he said they were ferns, like what I showed them last week, but he thought they were chiselled on the stone. Their surprise and pleasure were great when I explained the matter to them.[799]

Mary Carpenter was a social reformer; but science played as large a role in her record of *how* reform could be effected as did faith. She borrowed from her brother Philip's geological specimens when she began teaching, and while her own interests would shift to social reform, she clearly viewed her own work on poverty and children as contributing to the same picture of nature that her brothers contributed to in conchology and physiology. The influence of her father, Lant Carpenter, has been treated at length by Harriet Schupf in one of the earliest pieces on Mary Carpenter.[800] Since then, historiographical interest in Mary Carpenter has

799 Quoted in P Browne (1887), pp. 87.
800 H. W. Schupf, 'Single Women and Social Reform in Mid-Nineteenth Century England: The Case of Mary Carpenter', *Victorian Studies,* no.17 (March 1974), pp. 301–17.

thus far focused on her travels in India, her contributions to the suffrage movement and her position as an intellect in the Victorian era.[801] Yet despite the fact that William Benjamin wrote a biography of his (more famous) sister Mary at the time of her death and that William Benjamin's views on social issues – child development, temperance, the role of the asylum in society, abolition, and race – are aligned with those of his sister, no work has yet been done on reassessing William Benjamin's worldview as being influenced by his sister Mary.

Mary Carpenter's earliest works on the subject of social reform were her 1851 Reformatory Schools: For the Children of the Perishing and Dangerous Classes and for Juvenile Offenders, followed swiftly by her 1853 Juvenile Delinquents, their Condition and Treatment. Both works were key in Carpenter's involvement in the passing of the Juvenile Offender's Act in 1854. The writing of these works is contemporary to Carpenter's turn to social causes, in the writing of his 1849-51 prize essay on temperance. She portrays the problem of poverty as medical, and one that can be approached best through the idea that what must be reformed is not merely the individual, but the stock:

> [It is a] moral disease with which we are attempting to grapple. We have endeavoured in the youthful patients before us to point out the symptoms of their morbid condition, which in some is merely accidental, the effects of external circumstances which may be removed; in others of a long habit of vice, and a total absence of all regenerating principles; in others again, it has borne the stamp of a deep-rooted and hereditary malady.[802]

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801 T. Allender, 'Mary Carpenter And Feminine 'Rescue' From Europe, 1866–77', In T. Allender (ed.), *Learning Femininity In Colonial India, 1820–1932*, (Manchester, 2016), pp. 91–128. See also: Gehring, T., And Bowers, F. B., 'Mary Carpenter: 19th Century English Correctional Education Hero.' *Journal Of Correctional Education* 54.3 (2003), pp. 116–22. See also: J. Schroeder, 'Self-Teaching: Mary Carpenter, Public Speech, And The Discipline Of Delinquency', *Victorian Literature And Culture* 36.1 (2008), pp. 149–61.

802 M. Carpenter, Juvenile Delinquents, Their Condition And Treatment (London, 1853), p. 161.

As Vanessa Ryan observes, Mary Carpenter utilised physiological and psychological arguments in her works, most notably her work *Reformatory Schools* (1851) and *Juvenile Delinquents* (1853).[803] Mary Creese has also commented on the relationship between the Carpenters at this point, suggesting that Mary Carpenter was instrumental not only in utilising her brother's work in physiology, but in applying it to the question of the psychology of juvenile delinquents – and further, that it was due largely to Mary Carpenter that many of the positions William Carpenter argued for were debated between 1854 and 1857 in parliament, with the result that parliament expanded funding for schools like that of Carpenter that were operated according to physiological principles.[804] 'Moral disease' for Mary Carpenter was an affliction of the constitution, rooted in habituation and transmittable to one's offspring. Within Unitarian theology, 'moral disease' was commonly interchangeable with sin, to signify that as "sickness is not merely absence of health" so too sin is not merely the absence of goodness.[805] The Unitarian minister Jared Sparks, in his attempts to explain the Unitarian faith, wrote for the *Unitarian Miscellany:* "There is no theme, in fact, on which Unitarian preachers dwell, more, than on the moral depravity of man. This is the moral disease, which they believe the religion of Jesus was intended to heal. As a free agent, man has contracted this disease."[806] Mary Carpenter built up her argument for moral disease with case studies and anecdotes from her schools, the same way that her brother (and most

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803 See V. Ryan, Thinking Without Thinking in the Victorian Novel, (London, 2012), p. 86.

804 See M. Creese, Ladies in the Laboratory, (Lanham, 2000), fn. 358, See also I.S. Hearnshaw, A Short History of British Psychology, (London, 1964), p. 30 – for a third discusssion, see J. Manton, Mary Carpenter and the Children of the Streets (London, 1976, pp. 122-3).

805 R. P. Stebbins, 'Sin', The Unitarian Review and Religious Magazine no.2 (December 1874), p. 443-446, p. 444

806 J. Sparks. An Inquiry into the Comparative Moral Tendency of Trinitarian and Unitarian Doctrines (Boston, 1823), p. 291.

physicians of the era) discussed disease and heredity. Mary Carpenter held greater political aspirations than her brothers, and in addressing the question of moral disease she petitioned parliament in support of a bill in 1862 that would allow schools with uncertified masters (like herself) to have an increase in aid.[807] Carpenter's name was already well-known within parliament on the subject of ragged schools – when, in 1854 Lady Byron funded the establishment of her first school in Bristol, it attracted national attention.[808] But her confrontation of moral disease was not limited to political and philanthropic petitioning – by the 1880s, her posthumous reputation as a woman that had first-hand experience of the impoverished neighbourhoods from which the disease sprang had become integral to her memory. Phyllis Browne tells us: "She never had any fear in traversing these wretched courts and alleys, and would go alone, and at night, into places where policemen only went by twos."[809] We have no reason to doubt the narrative; but certainly what is essential is that Mary Carpenter was perceived as a *practitioner*, someone who had immediate and direct knowledge of the condition of the criminal young.

The medical description of children afflicted with moral disease consisted of stressing that these children suffered a total reversal of normal childhood development. Mary Carpenter seized on the rapid development of the *will* in such children, and viewed this rapid development of the faculty as detrimental, rather than as a mark of intelligence or talent in the child. When we appreciate that, for

807 See Hansard 1803-2005, HC Deb 05 May 1862 vol 166 cc1204-77, Stable url: http://hansard.millbanksystems.com/commons/1862/may/05/committee#column_1245, accessed July 21st, 2017.

808 See for instance D.M. Emerson, J. Edwards, H. Knox, *Standing Before Us: Unitarian Universalist Women and Social Reform, 1776-1936* (Boston, 2000), p. 230.

809 P. Browne (1887), p. 85.

Mary Carpenter, the impact that habits have on the body are transmitted to offspring, the true gravity of her physiological opinion of such classes can be grasped:

> It will be at once evident to all who have realized to themselves the condition, physical, moral and spiritual of the children described in this volume, as well as to those personally and practically acquainted with it, that the childhood of the 'perishing and dangerous classes' exhibits features in every respect the reverse of those here described by the physiologist and the divine. The muscular powers, the organs of locomotion, are prematurely developed, and the child discovers in himself the capability as well as the necessity of taking an active and independent part in the world around him; the *will* early acquires an unnatural strength from being unchecked and unguided by authority or reason: and all these are far in advance of the 'governing faculty of the mind,' for the intellectual powers have been exercised only in subservience to the gratification of animal desires, the spiritual nature being almost entirely dormant.[810]

Mary Carpenter viewed the organs of children as (crucially) more flexible than those of adults, and hence grounded the possibility of reform in physiological fact: it was not spiritual and moral reform alone: her schools, if invested in and maintained the way she believed they ought to be, would cause as much physiological regeneration to the lower stocks as could be uncovered in a generation.

Such views brought Mary Carpenter in close company with asylum doctors and writers on the causes of madness in the 1850s – and yet Mary Carpenter dreaded the prospect of visiting an asylum.[811] Her brother, William Benjamin Carpenter, also had little direct experiences of asylums – he paid a visit to Hanwell Asylum during Connolly's tenure, during which he came away with the sole observation that: "It is my belief that two-thirds of the women here have come to

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810 Carpenter, M. *Juvenile Delinquents, Their Condition and Treatment*. (London, 1853), p. 296.
811 M. Carpenter, *Six Months in India (*London, 1867), pp. xx.

require restraint, through the habitual indulgence of an originally bad temper."[812] Given the great extent that brother and sister relied upon statistics from prisons and asylums, their lack of interest in visiting themselves is interesting. Both Carpenters clearly viewed themselves as in a position to draw upon the work of asylum doctors, yet as not themselves requiring any experience themselves of the institutions. Despite the occasions where a family that had drawn her concern occasioned her to visit a prison or workhouse, she did not pay a visit to an asylum until her travels to India in the 1860s, and when she did she was astonished (like many asylum visitors in the 19th century) at the appearance of sanity and reason amongst the patients.[813] The family narratives that Mary Carpenter employed, however, follow the same pattern of those used by asylum doctors in representing how moral disease is transmitted via heredity:

> A woman in deep grief came to ask information from me how to learn any particulars respecting her son, who had lately committed suicide in a convict prison. [...] She had made an unhappy marriage, and her husband, being much given to drink, treated her cruelly. Before the birth of this poor young man her husband had been particularly brutal to her. The child early showed signs of great irritability, and of a violent uncontrollable temper.[814]

The case of this anonymous woman is presented by Mary Carpenter as one of three that illustrate the role played by heredity (and the transmitted effects of alcohol) in crime. The assurance from the author that the child 'showed signs of great irritability' early in development is a key that Carpenter is pointing to points of heredity, visible to the trained eye.

Conclusion

812 W.B. Carpenter, *Mental Physiology* (Philadelphia, 1875), p. 663.
813 M. Carpenter. *Six Months in India* (London 1868), p. xx.
814 Carpenter, M. *Our Convicts,* Vol. 1 (London 1864), pp. 45.

The temperance movement's relationship to phrenology was as important as its relationship to Christian churches. Temperance advocates were motivated to find evidence that alcohol not only deteriorated the individual, but that the degeneration caused by intoxication would be transmitted to offspring. Phrenological texts, journals, and periodicals, provided a key source of information for many temperance advocates. Within phrenology, temperance provided a valuable means of retaining relevance and authority within a scientific milieu that was increasingly hostile and sceptical to its efforts to promote the cause of phrenological science. The authority that phrenologists wielded on hereditary diseases of the mind became integral not only to the promotion of Christian phrenology, but also to the temperance movement's ability to claim that there was clear science that argued in favour of teetotalism. The danger to the unborn provided a rhetorical means by which phrenologists remained important to the temperance movement, and the cases that asylum doctors put forward often became repeated and further diffused through temperance pamphlets and sermons.

In the case of William Benjamin Carpenter, I have argued that his dedication to the temperance movement not only influenced his physiological views, but reminds us that his position within the Unitarian community was as highly-valued by him as was his position in the scientific community: and causes like temperance provided occasions where these dual projects coincided. The importance of being able to draw on the evidence base of physiology, even though it lacked experimental studies and remained anecdotal, provided a means by which the danger to the unborn could be highlighted and made authoritative. It is remarkable, as I showed in the last chapter, that despite the importance of Carpenter's work on orbitolites, and later on foraminifera, the evidence that he gathered in support of spontaneous variation became increasingly less significant in informing his views on heredity. At the same time, his sister Mary Carpenter was becoming increasingly of the opinion that the inheritance of acquired characteristics was not only a causal force in determining the condition of those that lived in poverty, but it also provided a means by which education and social reform could redeem and improve the lower classes. Mary Carpenter appealed to the authority of her brother on espousing this physiological doctrine, at the same time as William Benjamin Carpenter appealed to his sister's authority in making the case that there was widespread, social evidence of the workings of heredity in Britain's lower classes.

In this final chapter, I hope to have shown that as the century progressed, the inheritance of acquired characteristics became a tangible and real part of religious doctrine and attitudes towards contemporary ills. In the campaign against the abuse of spirits, familiar biblical ideas found scientific and medical expression. Whatever W.A.F. Browne's religious commitments may have been, his documentation of cases of insanity brought on by intemperance – and the transmission of such weakness to drink – became important not only to Carpenter, but to later generations of religious authorities that drew upon a public well-versed in the familiarity of such cautionary tales. Perhaps more so than agriculture or gardening, the popularity and the enthusiasm of the proliferation of the temperance movement brought the inheritance of acquired characteristics into many people's lives as one of several 'unavoidable truths' that supported teetotalism.

Temperance literature is vast, and this chapter has only endeavoured to provide space within which the authorities I discuss in chapters 3 and 4 could be considered as temperance advocates in their own right. I have focused upon how these figures viewed cases of hereditary alcoholism as a means of promoting or using the language of the inheritance of acquired characteristics. Even within these confines, the importance of religion to ideas about the hereditary dangers of alcohol is clear. While there were never as many individual cases drawn from asylums as figures like W.A.F. Browne hoped his generation would produce that demonstrated hereditary taint, the statistics and anecdotes that were produced became established evidence within the wider temperance literature. While Carpenter's Unitarian faith is sometimes pointed out as exceptional, and the key to understanding how he was able to incorporate some ideas about geology and evolution into his faith, it is also important to recognise that Carpenter's Prize Essay and the temperance movement were part of mainstream Anglicanism, as well as the territory of dissenters. Printed materials were only one dimension of the temperance movement: more so than other forms of diffusion considered in this chapter, lectures, organised events, sermons, and public demonstrations provided a means of giving these ideas further expression within public life. As I showed in the case of Mary Carpenter, they also began to coalesce with ideas about the poor and criminals, forming the literature of degeneration that Daniel Pick makes the subject of his landmark 1989 book. Here, I have shown that insofar as the temperance movement, this idea of degeneration was produced in part by the labours of the proponents of the inheritance of acquired characteristics, and the pursuit of evidence that supported this belief. While many of the cases discussed in chapters one and two related to a spirit of optimism, the human case became increasingly negative. With the publications of Morel and the philosophical systems of Herbert Spencer looming on the horizon, the inheritance of acquired characteristics was set to change in meaning and significance. Many of the narrowly-focused goals held by agricultural, gardening, and botanical communities still existed, but the inheritance of acquired characteristics had become important and essential enough to take on roles in larger debates about the economy of nature, divinity, teleology, and the fate of the human races. In my conclusion, I set out some questions concerning later employments of the inheritance of acquired characteristics that could be investigated by returning to agricultural and gardening magazines in the latter half of the 19th century. But here I have hoped to show that while many advocates of a secular society employed the language of the inheritance of acquired characteristics, the idea *gained* in relevance and importance to religious and conservative authorities. This, I have argued, was due to the labours of authorities like Carpenter, Youatt, Bushnan, and others, who worked to communicate the continuity between this idea of heredity and familiar ideas about sin and inheritance.

Conclusion

This thesis has argued that the emergence of the theory of inheritance of acquired characteristics as a means of thinking about heredity was inseparable from the cultures of knowledge that emerged around gardening, agriculture, animal breeding, medicine, phrenology and temperance in the early decades of the 19th century. The wealth that accumulated during the agricultural revolution, accompanied by a renewed way of looking at the promises of agriculture, fostered a conviction that crops, livestock, and even the family, could be improved through the aid of science. By looking at the periodicals which strove to create communities of practitioners in these fields, we can explain how and why the inheritance of acquired characteristics become a popular and widespread belief.

I showed in Chapters One and Two that practical agricultural and gardening periodicals sought to foster a culture of observation and reporting among the members of the communities that they were creating. In Chapter Three, I argued that this culture of observation was also being promoted in asylum medicine and in phrenology. While readers did not always reach the level of engagement and production of science envisioned by editors, there was substantial contribution from minor and anonymous practitioners in these various disciplines. In Chapters Four and Five, I argued that compiling unusual cases and stories was not only an important method within physiology and also scientific temperance writing, but that on the act of compiling these cases gave them new scientific legitimacy and authority. For a scientific culture where Baconian methods were prized as a means of arriving at truth, compilers like William Benjamin Carpenter were helping to establish the theory of the inheritance of acquired characteristics within the accepted laws of nature.

In my introduction, I set forward the three components of the transmission and popularisation of the inheritance of acquired characteristics which would be examined in the thesis. The first of these is the culture of observing and reporting that was embraced by many readers of science periodicals. The second, closely related, is the periodical press itself as a means of legitimating these observations and turning them into evidence. The third is the attractiveness that the idea of the inheritance of acquired characteristics held for many religious authorities and medical writers. By considering these three aspects together – the Baconian collation of evidence which was legitimated by publication and promoted for scientific, commercial and religious purposes – we can understand the interconnected ways in which the theory came to prominence.

Firstly, observing and reporting as scientific activities were crucial to the rising fortunes of this way of viewing nature. By drawing upon contributions made by readers to practical science periodicals, this thesis has brought a new means of analysing readership to bear on the question of who believed in the inheritance of acquired characteristics and why. Historians such as Corsi and Burkhardt have long suggested that the idea was widespread, even universal in early 19th century Britain.[815] But as this thesis has shown, the public belief in the inheritance of acquired characteristics was inextricably tied to practical and local questions concerning animal breeding, plant cultivation, and the health of the family. Sir Michael Ridley, discussed in Chapter Two, reported success in acclimatising wheat from Van

815 Burkhardt (1977), p. 5. See also Corsi (1987).

Diemen's Land to the climate of Northumberland.[816] The efforts to elicit cases supporting the idea, and later efforts to compile these cases, were the means by which the vague boundaries of 'like produces like' came to include acquired characteristics, as in the case where veterinarian Delabere Pritchett Blaine recorded cases that were later used by other authorities as evidence of the inheritance of acquired characteristics.[817] The inheritance of acquired characteristics was not a widespread *scientific* belief prior to this industry. The appeal to evidence and natural law is an integral part of the idea. By looking to the activity of contributors, minor practitioners, and amateurs, this thesis has shown how the inheritance of acquired characteristics became a fact, a scientific truth available to many people.

While there are histories of the idea of natural selection and evolution, this thesis is the first to provide a history of the inheritance of acquired characteristics which interrogates the assumption that belief in the theory was widespread in early-19th century Britain. By drawing on the content of practical gardening magazines, agricultural and veterinary journals, it has drawn on minor and anonymous figures in order to provide a means of assessing if there really was widespread belief in the inheritance of acquired characteristics in the years before Darwin's publications. The methodology employed in this thesis of prioritising the content of practical science magazines, and looking to identify reader contributions and engagement, provides a means of addressing questions about other ideas of heredity like chance variation and also selection. By paying closer attention to the

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816 In H.W. Wilson, ''Wheat and Maize', Read at the Royal Agricultural Society of England, June 16 1849', *The Gardener's Chronicle,* no.9 (1849), p. 379.

817 D.B. Blaine, *Canine Pathology* (London 1817), p. 46.

contributions of anonymous and minor figures that wrote to practical science magazines, we gain a closer appreciation for how ideas like 'the inheritance of acquired characteristics' were used and employed by a wider population.

Moreover, this thesis contributes to the growing interest in the amateur science of the 19th and 20th centuries. While many of the key figures discussed are not true amateurs, this thesis has examined how the editors of science magazines and periodicals sought to elicit experiments and observations from their readers, both professional and non-professional, and plots their successes. These never matched the ambitious and utopian ideals that the editors espoused; but that should not be counted as failure. John Lindley, when he received Purser's correspondence, announced that the amateur's experiments in graft-hybrids had helped to uncover the workings of natural law.[818] The history of the inheritance of acquired characteristics is pervaded by practical aims held by animal breeders, gardeners, and botanists. By prioritising these practical aims, as I have done in this thesis, the importance of the work of these figures in producing a community of knowledge becomes visible.

Secondly, I have argued that we need to look at the content of practical science periodicals in order to understand how evidence for the emerging science of heredity was produced. By the 1820s, writers like Charles Lyell and George Combe were working to consolidate and compile evidence that could decide how nature's laws govern inheritance. The machinery of eliciting and publishing the

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[818] E. Purser, 'Laburnum Sports', *The Gardener's Chronicle,* no.16 (May 30th, 1857), p.382, p.400.

observations of its readers that periodicals had put in place provided an important source of evidence for this activity. William Youatt, I argued, knew that the success of his work depended on his ability to lend legitimacy to the knowledge and practice of the breeders and farmers that bought his treatises. John Loudon and John Lindley followed this same approach: they too presented the practices and ideas of practical gardeners as deserving attention as scientific activity. As Lightman has argued, the early decades of the 19th century were a golden era for Benthamite scientific activity.[819] This economic model of the science periodical that depended upon its readers for the production of content provided a means by which new evidence could be produced. In some cases, as I showed in Chapter Two, debates over unusual cases like that of *Cytisus Adami* provided a means by which both minor gardeners and scientific authorities shared a space in which this evidence and its significance could be debated. Readers and contributors not only produced cases and observations, but they also took a role in the discourse over what these observations meant, and what they could (or could not) suggest about the laws of inheritance.

This thesis has also charted how smaller parcels of authority were contended for in scientific periodicals, magazines, and encyclopaedias. A lot of the success that the inheritance of acquired characteristics enjoyed, was tied to the opportunities for the construction of authority that observations and evidence offered. Van Wyhe, in his discussion of authority, argued that: "authority can be presumed, forged, or even coerced, as well as conferred by others."[820] Despite this

[819] B. Lightman, Victorian Popularizers Of Science: Designing Nature For New Audiences (Chicago, 2007).
[820] Van Wyhe, J. (2004), p. 18.

fluidity, Van Wyhe viewed authority as essentially tied to the appeal to nature. Thus, the presuming, the forging, and the coercion that Van Wyhe groups as expressions of authority are all limited by the capacity of persons to speak for nature, to adopt the stance of being able to delineate and articulate its laws. This thesis has focused carefully on the importance of *conferral*. In the example of agriculture, I explored how Darwin conferred authority on Youatt; I explored further how Youatt had, earlier, conferred authority on fellow veterinarians and animal breeders through his publications and journal. Practitioners in agriculture and gardening, if their observations were to be of any use to writers like Darwin, necessitated authority in their own right: the respect of being reliable, competent, and not given to invention or confabulation. Scientific authority, in the 1830s and 1840s, was even extended in cases to patients and lunatics, as patient testimony became constitutive of diagnosis and the investigation of family illness as discussed in Chapter Three. Often, conferring authority on a nurseryman, an animal breeder, or rural doctor was not particularly useful to the individual, but integral to the utility of the evidence itself; thus the conferral of authority on anecdotes and observations.

Thirdly, the religious context is important to understanding the appeal and attractiveness that the inheritance of acquired characteristics held for a society that remained deeply religious. Secularists, radicals, and religious authorities all made use of the language of the inheritance of acquired characteristics. I have argued that the religious authorities were more important to understanding how the inheritance of acquired characteristics became widespread; firstly because they outnumbered the authorities that historians have recognised as genuine materialists, atheists or radicals, and secondly because the public remained overwhelmingly Christian. Where many biographies of 19th century scientists have placed importance on personal faith, I have followed Charles Taylor in arguing that we can capture the relationship between science and religion by focusing instead upon 'conditions of experience'. That is to say, are people in this period and time experiencing the natural world as impersonal and mechanical, governed by natural law, or are people in this period and time experiencing nature through religious ideas? By adopting this paradigm, we can account for scientific authorities that may have lacked personal faith or an interest in religion, yet maintained a worldview that shared the essential features of a Christian view of the natural world. By adopting this position, I argue that the inheritance of acquired characteristics was seldom a means of encouraging people to view the world in which they lived as impersonal and governed by mechanical processes. More often, the idea found popularity and utility in those that were invested in maintaining a worldview identifiable as religious or Christian.

Bucchi argued that the history of science must make room for the 'active influences' of popular discourse.[821] In this thesis, I have argued that in the 1830s and 1840s, this public discourse remained deeply religious: not exclusively religious, but in a society where the majority of people maintained a Christian worldview, we need to take seriously the efforts made by religious authorities like William Youatt, John Bushnan, William Carpenter, Charles Lyell, and numerous others to promote the inheritance of acquired characteristics. The idea of radicals, or of radical

821 Bucchi, M. *Science and the Media* (London, 1998), pp. 8-12.

Lamarckians somehow outpacing the efforts of these authorities to promote the idea within the confines of religion is untenable. There were enough disagreements between denominations to endanger the efforts of figures that we identify as sharing a 'religious' worldview. The inheritance of acquired characteristics did not emerge solely from religious authorities by any means, but the appeal of an account of heredity that mapped elegantly onto familiar ideas of sin and inheritance is integral to understanding how it became widespread.

This thesis does not extend its focus beyond the 1850s, as the appearance of Darwin's *Origin of Species* forever changed the lay of the land in debates over the inheritance of acquired characteristics. More work needs to be done to understand how this practical theory became, for a second time, linked to the question of transmutation and evolution. We also lack an understanding of how, precisely, Lamarck's name came to be associated less with the idea of transmutation, and more with the inheritance of acquired characteristics, despite the fact that Lamarck's understanding of the inheritance of acquired characteristics differed greatly from the forms discussed in this thesis or the form later articulated by Darwin. The 1890s have been described by Peter Bowler as the pinnacle of Lamarckism's fortunes.[822] Did the same forms of evidence remain as crucial and relevant to the diffusion of Lamarckism in the late 19th century? More work needs to be done tracing the presence of the inheritance of acquired characteristics in the schools of botany, agriculture, and farming for this period (outside the example of Lysenko). This thesis has provided a context for the popularisation of the inheritance of acquired characteristics, and also a deeper understanding of how it

822 P. Bowler, *Evolution: The History of an Idea,* (London, 2009), p. 236.

was tied to the practical aims and also the anxieties of different communities in Britain, an approach that could be extended to these later periods of thought.

The theory of the inheritance of acquired characteristics is the most important understanding of heredity advanced in the 19th century, alongside the ideas of chance variation and selection. While the latter two theories have received attention in the history of ideas, the inheritance of acquired characteristics has been largely hidden by the shadow of Lamarck. This thesis is not the first to dissociate the idea from Lamarck; but it is the first to provide a means of understanding how it became a widespread belief independent of the reception of Lamarck. The inheritance of acquired characteristics was produced by minor figures, practitioners and amateurs, and also pushed forward by the interaction between religion and science. The periodical editors considered here conceived of human industry and society as one vast ongoing experiment that would yield knowledge on the laws of inheritance. Instead of being a radical idea that spread through the progressive circles of British science, it belonged first and foremost to the periodical press and the diffusion of practical science. It was here that the idea found its largest engagement and also its most productive activity.

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