

More like Cooking than Science: Narrating the Inside of the British Medical Laboratory, 1880-1914

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In Arthur Conan Doyle's second Sherlock Holmes novella, *The Sign of Four* (1890), we encounter a laboratory space within Bartholomew Sholto's bedchamber. Holmes and Watson have travelled to Pondicherry Lodge to reclaim the Agra treasure that lies at the heart of the story. On seeking Bartholomew Sholto, who appears to have locked himself in his bedchamber, Holmes and Watson break down the door to find a laboratory in which

A double line of glass-stoppered bottles was drawn up upon the wall opposite the door, and the table was littered over with Bunsen burners, test-tubes, and retorts. In the corners stood carboys of acid in wicker baskets. (43)

This blending of the domestic and the laboratory sits uneasily with historians' representations of late-Victorian medical laboratories as modern and professional spaces. They might dismiss Conan Doyle's image as an example of the crime genre; suggest that it is somehow quaint or idiosyncratic, or show how it conforms more to the spaces occupied by the amateur scientist than with a style of modern scientific medicine associated with the laboratory. Certainly, Holmes' encounters with the laboratory and his own experimentation throughout the Holmes' canon do not match the professionalising account associated with the 'laboratory revolution' in medicine. According to this narrative, the development of new laboratory practices after 1850 through physiology, bacteriology and pathology not only represented the establishment of new medical specialisms, but also involved rapid and dramatic changes in medical education, research, and the understanding of disease. The result was a series of remarkable advances in medicine and a transfer in medical authority from the clinic to the laboratory that saw a paradigm shift that left little room for traditional practitioners or the amateur. But should Conan Doyle's image of a laboratory space be dismissed so easily? Was it just in the realms of the scientifically-minded detective or the gentleman scientist that the laboratory inhabited such domestic and apparently incidental spaces?

In the historical literature, the day-to-day work of the laboratory and the spaces in which medical science was performed has often been marginalised. In part this has been a consequence of the assumptions made about questions of professionalisation, institutionalisation, and the growing importance of a series of laboratory disciplines to medicine. Our conceptual image of the laboratory as a site for discoveries owes far more to the institutional structures developed in Germany and France around physiology and bacteriology than they do to British endeavours, which are often represented as dominated by empirical, bedside medicine (Lawrence, "Incommunicable Knowledge"). However, just as historians have come to question the boundaries of the "laboratory revolution" to reveal how the laboratory initially served a more subordinate role in medicine, the location and nature of laboratory practice also need to be re-examined (Brunton; Worboys, "Was there a Bacteriological Revolution?"). Encouraged by the anthropological work of Bruno

Latour, Steve Woolgar and Frederic Holmes, historians of science have increasingly pointed to the contingent nature of science and the material culture of experimentation. Although in doing so they have tended to celebrate the growth of specialised, extra-domestic spaces, one result is that they have demonstrated how scientific papers represent a retrospective experimental narrative of success that often downplayed both how ideas evolved in the course of experimentation and writing and the problems encountered in producing laboratory knowledge (Holmes 224-233). If the laboratory is no longer perceived as simply a reflexive site, histories of laboratory medicine have a tendency to marginalise this problematic category of "practice" and the nature of experimentation, unless that experimentation relates to the controversial practices associated with vivisection (Cunningham and Williams; Rupke). This situation is hardly surprising: what went on inside medical laboratories often evolved in an *ad hoc* manner and is difficult to quantify, especially when approached through the narratives contained in scientific texts. As John Warner has shown, this way of conceptualising the laboratory has resulted in a number of dichotomies in the literature between medical science as discourse and medical science as practice (Warner, "History of Science" 164-93).

To get round some of these difficulties, this essay examines the problematic categories of space and practice in laboratory medicine in Britain at a time when the laboratory was providing new configurations for research, for the understanding of disease, and for the formation of new disciplines. Rather than reading scientific articles as texts, it draws on literary representations and accounts of laboratory work to explore questions of space and practice and examine the boundaries between what might be broadly understood as the professional, the institutional, and the domestic. Much of the fast growing genre of magazine fiction of the *fin de siècle* employed science or science fiction as a theme to create scientific romances. In her work on Wilkie Collins, Laurence Talairach-Vielmas has suggested that novelists found ready inspiration in anxieties about laboratory medicine as they swapped the staples of eighteenth-century Gothic fiction for "ambitious scientists, helpless patients and newly painted asylums or laboratories" (7). As scientific culture extended into popular culture, numerous references to medical experimentation emerged in literary texts of the period. These references are often found in connection with fears of vivisection as mirrored in Wilkie Collins' *Heart and Science* (1883) or H. G. Wells' *The Island of Dr. Moreau* (1896). In these fictional accounts, the laboratory has often been regarded as signifying a place of unease or danger. However, by concentrating on Robert Louis Stevenson's *The Strange Case of Dr Jekyll and Mr Hyde* (1886), Arthur Conan Doyle's *The Sign of Four* and *A Study in Scarlet* (1887), Arthur Machen's "The Great God Pan" (1894), and Edith Nesbit's "The Three Drugs" (1908) and "The Five Senses" (1909) it is possible to present a different view of the laboratory as a more familiar space. This essay asks whether these fictions might present a more accurate picture of laboratory medicine than the retrospective experimental texts or public announcements of discoveries left behind by those who produced laboratory knowledge.

This is not to ignore the complex set of relationships these literary texts had with contemporary science or how they have been read as explorations of contemporary anxieties about gender, sexuality, immigration, degeneration, evolutionism, and empire (Hurley; Smith; Mighall; Reid). Rather, it is to see them as not only texts that drew on contemporary medical thinking, but also as texts that help construct contemporary notions of medical spaces and practices. As Graeme Gooday

reminds us, it is often outside the laboratory that "one finds debates about what a laboratory should be" (786). Although medical science and representations of science in Gothic and crime fiction are not the same thing, as Claire Jones in her work on the Cavendish Laboratory explains, "anecdotes of laboratory life" were "picked up by journalists and fiction." These in turn were "reflected back to the laboratory" and how they were represented in memoirs and in popular accounts as heroic, experimental and often dangerous places (178). Hence, rather than presenting an experimental narrative of success or an account of how knowledge was institutionalised, this essay explores the places in which laboratory knowledge was created and the often messy nature of experimentation. In doing so, it illustrates how, rather than being revolutionary sites or unproblematic spaces, in medicine, laboratories could inhabit unexpected places; how the production of laboratory knowledge was often more like cooking than science.

Spaces and Places

Ideas of what constitutes 'science' and the 'laboratory' and their role in medicine have changed over time. The term 'laboratory' was employed to describe scientific spaces (often domestic in nature) in the seventeenth century, but historians have suggested that it was only from the 1850s onwards that the laboratory became increasingly central to science and medicine (Bynum 92). After 1850, science became a form of cultural self-expression, part of a middle-class discourse, as science was constructed as the knowledge of "most worth" (Spencer 21-96). One result was that the laboratory was increasingly presented as the place where various forms of scientific and medical knowledge were fashioned to create a laboratory-centred representation of science. Doctors had never doubted that medicine was an art and a science and routinely employed a vocabulary that invoked science as essential to knowledge. However, in the mid-nineteenth century, first through physiology and chemistry, and then later through bacteriology and pathology, laboratories acquired a growing role in medicine as places where knowledge was produced and diagnosis undertaken. These changes were institutionalised in how doctors were trained as laboratory experience and findings were incorporated into medical education. In their writings, physicians and surgeons increasingly co-opted a discourse of scientific naturalism, which became characteristic of debates on a wide range of social issues (Lawrence, *Medicine* 70). Although historians have shown how the positioning of the laboratory was both a rhetorical and a practical resource, by the 1880s contemporaries were clear that without science and the laboratory medicine was, as the *British Medical Journal* explained, merely "empirical routine" ('Abstracts of Introductory Addresses' 583). In reviewing Conan Doyle's works in 1892, one of Doyle's former tutors, the surgeon Joseph Bell who provided one inspiration for Holmes, explained how prevention and diagnosis had come to consist of "the recognition and differentiation by bacteriological research of those minute organisms" responsible for disease, a process only possible in the laboratory (Bell 80). Clinicians spoke of the two worlds of "examination at the bedside and the investigation of pathological and bacteriological products in the laboratory" (House Committee, 9 May 1895). If the relationship between these two worlds was complex, by 1900 a series of laboratories – chemical, physiological, bacteriological, pathological – had become "obligatory passage points" through which medical students and researchers had to pass (Jardine 304).

It is clear that these changes happened in a material environment but where were these laboratories? What places did they occupy? Graeme Gooday has suggested

that there were "limits to the kinds of space that could be turned into a laboratory-like setting" (785), but does Gooday's claim mean that laboratories could only be found in certain locations? Work on Victorian popular sciences, notably phrenology, mesmerism and artisan botany, has already shown how science was produced in a variety of locations from coffee houses and meeting halls to museums, gardens and public houses (Secord). Before 1800, the home and often the kitchen provided both a key location for the laboratory and the basis for investigation. In the nineteenth century, professional scientists fashioned a series of institutionalised spaces, practices and methods that aimed to break with the amateur and domestic laboratory of the past, but the laboratory's association with the domestic continued beyond the early nineteenth century. The first 'public' laboratories at Oxford and Cambridge had a strongly domestic feel. Mark Weatherall has suggested that these laboratories resembled the country houses being built at the same time, combining as they did public and private spaces structured around a clear social hierarchy (306). Work on country-house laboratories by Simon Schaffer and Donald Opitz has demonstrated how these aristocratic private laboratories formed an important network that shaped scientific thought and practices in the physical sciences. Private medical laboratories were often not in the same league as those in country houses, but they and the laboratories established in medical schools and universities did share similar domestic features. Although a growing number of scientifically minded practitioners endeavoured to define the medical laboratory as a key location in which new forms of knowledge and an understanding of disease was generated, creating tensions within medicine, they equally could exist in a range of locations that had more in common with the domestic. It was these locations that found resonance in literary texts.

In Mary Shelley's *Frankenstein* (1818), the laboratory and the domestic are separate but ultimately intersect with disastrous consequences. In the text we hear how the prototypical Gothic scientist Victor Frankenstein conducts his experiments "In a solitary chamber, or rather cell." Frankenstein's "laboratory" is positioned "at the top of the house" and is "separated from all the other apartments by a gallery and staircase." In this isolated space, Frankenstein keeps his "workshop of filthy creation" (52). If Shelley prefigured later materialistic concerns about medical research, the positioning of the laboratory in *fin de siècle* Gothic and crime fictions locates the laboratory more intimately in the domestic. This repositioning of the laboratory reflects both the translation (or reworking) of the Gothic plot to new urban and domestic locations and a transition in medicine from the pre-eminence of 'dirty' and unsettling forms of knowledge associated with morbid anatomy and dissection to more laboratory-based disciplines like chemistry, physiology, bacteriology and pharmacology. Although one reading of Watson's first encounter with Holmes in "a lofty chamber" of a hospital laboratory at the start of *A Study in Scarlet* suggests that laboratories were at the centre of institutional medicine (3), the laboratory in *fin de siècle* fictions is more often found in household spaces.

As we have already seen, Conan Doyle places the laboratory in *The Sign of Four* in Bartholomew Sholto's bedchamber, while in *A Study in Scarlet* the same domestic associations are present. Rather than being a public space, the hospital laboratory is found in a "lofty chamber" at the end of a "long corridor with its vista of whitewashed walls and dun-coloured doors" beyond a "low-arched passage" (3). Here the connotations are of a private space that shares a similar location to the servants' quarters, pointing to the laboratory's liminal nature. Elsewhere in the Holmes canon, Holmes conducts experiments in his lodgings. For example, at the start of "The

Adventure of the Dancing Man" (1903), Watson notes how Holmes "had been seated for some hours in silence with his long, thin back curved over a chemical vessel in which he was brewing a particularly malodorous product" (583). In an earlier story, "The Adventure of the Gloria Scott", published in *The Strand* magazine in 1893, this idea of conducting experiments at home was reinforced. In the short story in which Holmes describes a blackmail case during his college days, he explains how after spending a month with his friend Victor Trevor at his father's Norfolk estate, "I went up to my London rooms, where I spent seven weeks working out a few experiments in organic chemistry" (345). In his experimentation, Holmes is more often to be found in the makeshift laboratory of the "chemical corner" of 221B Baker Street than he is working in an institutional or hospital setting (Doyle, "Adventure of the Empty House" 565).

Conan Doyle was not alone in the connections he forged between the laboratory, experimentation and the domestic. In *The Picture of Dorian Gray* (1891), Oscar Wilde refers to Alan Campbell's laboratory at home on a number of occasions (246; 255). The laboratory is more visibly present in Stevenson's *Jekyll and Hyde*. Although Lawrence Rothfield has suggested that the novella demonstrates contemporary antagonism to medicine (150), in *Jekyll and Hyde* Stevenson provides an insight into the laboratory. Robert Kiely and others have suggested that for Stevenson the more fantastic the story, the stronger the impulse to reflect reality (123). In presenting his "shilling shocker", Stevenson's descriptions of the laboratory therefore offers not Herdman's "crude scientism" but something more genuine in its evocation of the medical laboratory (132). As one anonymous reviewer noted in *The Times*, Stevenson "accounts for everything upon strictly scientific grounds" (13). If Stevenson was himself uncertain of where science was leading, in exploring through a series of narrators and discoveries the horrors behind the surface appearances of a comfortably professional, male London, he places Jekyll's laboratory at the centre of events. Early on in the narrative the reader is told how Hyde "mostly comes and goes by the laboratory" (19). While this reveals how the monstrous side of Jekyll is associated in the text with the laboratory, it is the lawyer Gabriel Utterson, Jekyll's loyal friend, who gives a brief description of "what is indifferently known as the laboratory." Housed "across a yard which had once been a garden" in "the block at the bottom of the garden", the laboratory is a place that inhabits the everyday. When Utterson is taken through this "dingy windowless structure", he finds "tables laden with chemical apparatus" (35). Although Conan Doyle in *A Study in Scarlet* locates the laboratory in a more institutional setting, he provides a similar description of the interior, which is "lined and littered with countless bottles. Broad, low tables were scattered about, which bristled with retorts, test-tubes, and little Bunsen lamps, with their blue flickering flames" (3). Such descriptions hint at the common paraphernalia of experimentation and the simple, almost austere nature of the laboratory.

In *Jekyll and Hyde*, the laboratory is not the only location for experimentation. Above this simple disorganised space, Jekyll experiments in his "cabinet". Much as the text itself is a collection of textual fragments and a pastiche of textual styles, the use of the word 'cabinet' is perhaps a reference to cabinets of curiosities where Jekyll is both the object of curiosity and the collector of curiosities. The description remains undeniable domestic and familiar, however. The cabinet in which Jekyll experiments occupies "a large room," which is "fitted round with glass presses, furnished, among other things, with a cheval-glass and a business table" (35-36). When Utterson and Poole, Jekyll's butler, hear Hyde's plea for mercy and screeches of "animal terror"

and respond by breaking down the door to Jekyll's cabinet, they find a room, which "but for the glazed presses full of chemicals," is the "most commonplace . . ." (64). Rather than being a disorganised or chaotic space, the association here is clearly with the everyday. By importing the monstrous into the familiar, many *fin de siècle* Gothic fictions worked the terror of the Gothic into domestic spaces whereas eighteenth-century Gothic tales had located them in foreign countries or antiquated spaces – castles, crypts, abbeys or palaces. In suggesting a close association between the cabinet and the laboratory, Stevenson's representation of laboratory spaces and the genre's aims come together.

Both Jekyll's laboratory and cabinet are attached to his house and are located in what was once a dissection theatre for training medical students (35). The inclusion of the dissection theatre probably reflects Stevenson's interest in the events surrounding bodysnatching in Edinburgh in the 1820s as evident in his short story "The Body Snatcher" (1884). However, we should recall that until mid-century private anatomy schools were key sites for gaining first-hand experience of anatomy. Although the heyday of the private anatomy school had passed by the 1830s, they continued to offer young doctors practical instruction in anatomy as well as opportunities for dissection. Established through entrepreneurial effort, many private anatomy schools were attached to their founder's homes and were not purpose built. In *Jekyll and Hyde*, this re-use of the dissection theatre is appropriate: by 1886, the laboratory had started to replace the dissection room as the place where knowledge about the body and disease was to be generated.

In other Gothic stories, such as Edith Nesbit's "The Three Drugs", Arthur Machen's "The Great God Pan" or H. G. Wells' "The Stolen Bacillus" (1895), the reader again encounters doctors researching or experimenting in their homes. In these short stories, the descriptions of the location of the laboratory and its materiality serve to highlight both their domestic nature and their physical characteristics, making them easily recognisable as experimental spaces. Although Nesbit is better known for her children's books, notably *Five Children and It* (1902) and *The Railway Children* (1906), she wrote a series of supernatural stories in which reanimated corpses figured prominently. Mostly composed in the late 1880s, the stories in exploring the internal emotional or psychological conflicts of the protagonists reflect Nesbit's unconventional and often difficult domestic circumstances (Davies 8-9). Published in *The Strand* magazine in 1908, "The Three Drugs" recounts the tale of Robert Wroxham who, apparently attacked by thieves or "Apaches" in Paris, seeks safety in the home of a surgeon. Wroxham comes to discover that the ostensibly friendly surgeon is experimenting with a series of drugs to fashion a superman. His home becomes a place of menace and danger. According to Davies, Nesbit was probably influenced by the popularity of *Jekyll and Hyde* as both narratives use the device of a transformative agent or drug (12). Like Stevenson, her representation of the laboratory is both domestic and conventional. In concentrating on the materiality of the laboratory, the depiction dwells on the easily recognisable tools of experimentation. In the house, Wroxham finds "a long laboratory bench" with "bottle-filled shelves above it, and on it crucibles and retorts, test tubes, beakers" (Nesbit, "The Three Drugs" 50-51). Machen puts a similar image forward in his classic horror "The Great God Pan." Initially denounced by contemporaries for its degenerate and sexual content, the first part of the novella describes an experiment on an innocent young Welsh woman in a laboratory in Dr Raymond's home. Located at the end of a long dark passage, the laboratory shelves are "all laden with bottles and phials of all shapes and colours"

(186). Just as Machen positions his laboratory in a former "billiard room", in Nesbit's "The Five Senses", published in the *London Magazine* in 1909, the laboratory appears in a similar location to stress its domestic nature. At the end of the tale there are "whispers of a laboratory which is being built on to the house, beyond the billiard room" (167). Both Machen's account and Nesbit's highlight the physical characteristics of these domestic laboratories, but unlike Holmes' "chemical corner", their locations reflect the aristocratic country-house laboratories that Opitz and others have described (143-53).

Although the laboratories in these texts can be both incidental and central to the narrative, it would be easy to dismiss them as havens of the amateur experimenter or as quaint or idiosyncratic, especially given the apparent focus on dangerous forms of pharmacology that seek to transform man into something "abhuman" (Hurley 3-20). It would equally be straightforward to see these fictions as reworking contemporary scientific premises whereby supernatural phenomena are the result of scientific practices to give voice to *fin de siècle* concerns about medicine. Critics have suggested that the juxtaposition of the laboratory with the domestic in *fin de siècle* Gothic fiction served to make the domestic a place of nightmare, heightening the sense of terror by de-familiarising family and domestic spaces. This use of home laboratories seems to fit with this importation of terror into the home to create a particular type of "dread and creeping horror", which Freud in his influential essay "The Uncanny" (1919) suggests is aroused when something familiar becomes strange (368, 394). Certainly, these fictions point to the dangers of irresponsible science and contemporary anxieties about medical research (see below). However, the representations of the laboratory found in these texts are not Jerrold Hogle's "antiquated spaces." Rather than "insistent artificiality", these laboratories are more familiar than we might imagine (2, 15). After all, Conan Doyle had been a medical student in Edinburgh. As a student and then as a general practitioner in Southsea, he would have been familiar with the laboratory spaces he describes. As Catherine Belsey has argued, "total verisimilitude" was central to the "plea for scientificity" Conan Doyle put forward in Holmes (114). Although the connections between medical laboratories and the other writers are more tenuous, Machen had attempted a career in medicine before failing the preliminary examinations of the Royal College of Surgeons. As Julia Reid has shown, Stevenson engaged with science in complex ways (5-14). He corresponded with numerous contemporary scientists and appeared to have been fascinated with medicine. Through his long-term health problems, Stevenson had numerous dealings with medical practitioners, which included the London surgeon Frederick Treves, and in one of his recorded dreams he imagined himself as a medical student (Maynard 367).

Whereas Wilde in *The Picture of Dorian Gray* represents institutional laboratories as "fetid" by drawing on popular fears of dissection and vivisection associated with medical schools (252), the blending of the incidental and the domestic was not just limited to fictional representations but was a feature of late-Victorian medical science. Antivivisectionists often stressed how physiological laboratories were gothic places of cruelty, but as the governors of St Bartholomew's Hospital admitted in 1901, much research was done by "private enterprise" at home (Medical Committee, 3 April 1901). The physician Thomas Horder remembered that at the beginning of the new century:

The young consultant, trained in pathology, was able to add to the examination of the patient's body the examination of the patient's blood, his cerebrospinal fluid, his secretions . . . Then, on reaching home, the culture tubes were put into the incubator in the little basement laboratory before going to bed, and only fatigue could cancel out the excitement of anticipating tomorrow's findings. (Horder, *Fifty Years of Medicine* 12)

In addition to his "little basement laboratory", Horder had a "little glass-topped laboratory table with its row of test tubes" in his consulting room, although this was hidden from the patients' sight behind a screen (Horder, *Little Genius* 25). The necessity of converting domestic spaces and basements into "little" laboratories was in part because institutional facilities were initially limited. As the dean of St Mary's medical school explained in 1885, "we certainly ought to have [a] proper pathology laboratory . . . for there is no such place in any School" in London (St Mary's 318). Sophie Forgan has shown how in the first half of the nineteenth century laboratories were often relatively small and subordinate spaces, but the pattern persisted in medicine into the late nineteenth century (139-62). Although hospitals were increasingly perceived as "scientific workshops", as the pharmacologist Thomas Lauder Brunton commented in 1900, most scientific analysis was done in a makeshift fashion in the wards (Lauder Brunton to governors, 1900). At the Middlesex Hospital, for example, the physician Campbell Thomson remembered how at the end of the century "a table placed at one end of the ward on which stood the ordinary chemical reagents and a few test tubes, served for a laboratory" (Campbell Thomson 71). Wards were essentially domestic spaces modelled on the middle-class household and the presence of the laboratory in them should not be surprising given the value assigned to the bedside in medicine. Medical school laboratories existed in other domestic and at times unexpected settings. Lauder Brunton set-up his first laboratory in the scullery of the Middlesex Hospital, and when he moved to St. Bartholomew's he established his laboratory in a cupboard off the museum (*Clinical Journal*). Although museums in the mid nineteenth century provided one environment in which laboratories were developed, Lauder Brunton was not speaking metaphorically. Nor was he alone. The pathologist James Andrews, for example, conducted most of his early work in a makeshift laboratory in the attic of the Warden's House at St Bartholomew's (Girling Ball 204).

Even when medical schools established laboratories they were not the "lofty" spaces in which Watson first encounters Holmes in *A Study in Scarlet*. Many were liminal spaces; often cramped, dimly lit and poorly equipped, and were included, as one physician at St George's Hospital remembered, "only at the expense of continual alteration and some addition to the structure of the place" (Blomfield 83). When the physiologist Edward Schäfer arrived at Edinburgh in 1899, he found the rooms for research into experimental and chemical physiology of "no great size." He noted how they were "very imperfectly fitted", and how it "was difficult for work to be done in them" (qtd. in Kohler 46). At Cambridge, the Regius Professor of Physic complained in 1900 that "accommodation for research" in the pathology department "can scarcely be said to exist" (qtd. in Weatherall 158). Staff were crammed into what little laboratory space was available, while at Oxford iron sheds were used for medical laboratories until 1906 (Kohler 46). It was only gradually that greater investment was made in laboratory accommodation. When Almroth Wright took up the chair of bacteriology at St Mary's Hospital in 1902, for example, he was given £100 to make

structural alternations and to buy fittings for his laboratories; by 1908, he had secured further funding to furnish three wards as laboratories (Colebrook 176). However, investment in these laboratory spaces was more often driven by external demand, such as the need to provide income for analytical service for public health departments, or to supply facilities to teach medical students, than by research or patient care. Despite this increasing investment, laboratories often resembled the spaces represented in *The Sign of Four* and *Jekyll and Hyde*.

This institutional positioning of the laboratory and its domestic and often rudimentary nature should not be unexpected. As already noted, notwithstanding the rhetorical value doctors came to assign to the laboratory, laboratory knowledge was contested knowledge. As one pathology lecturer at St Mary's explained in 1899, "in some London hospitals scientific and experimental work is discredited and not allowed" (*St Marys Hospital Gazette*, 1899). Although St Bartholomew's opened a small laboratory in 1890 for the bacteriologist Edward Klein, ten years later Lauder Brunton was still arguing for a laboratory so that "the nature and physiological action of chemical substances could be investigated, and their poisonous or remedial action ascertained by experiment" (Lauder Brunton to governors, 1900). As Christopher Lawrence argues, elite doctors were sceptical of the value of the laboratory. Although they did not dismiss science, they were concerned that the new laboratory sciences would dilute their authority and jeopardise a system of bedside medicine that favoured individualised notions of disease (Lawrence, "Incommunicable Knowledge" 503-520). They consequently assigned the laboratory a subordinate role as a complement to clinical judgement, which they believed should dominate medicine and diagnosis. In teaching hospitals, as the historian Thomas Bonner explains:

the high cost of laboratory education, the dependence of the teaching enterprise on student fees and private practice, and the orientation of the hospital toward patient service all contributed to a reluctance to make any but the most necessary changes. (275)

The laboratory hence often had a low priority in terms of institutional space and existed in incidental places that resembled the domestic. Just as the laboratory had an ambiguous position in how medical knowledge was constructed, they also had an ambiguous physicality. Like Stevenson's use of marginal spaces in his portrait of Jekyll/Hyde, or Holmes' mediation of "epistemological frameworks - the reason and science associated with the British masculinity on the one hand, and the intuitive, the irrational associated with the foreign and feminine on the other," hospital laboratories were liminal spaces where bench and bedside met and were mediated (Taylor-Ide 55). It may have been the very fact that they occupied liminal places in medical institutions that laboratories found resonance with late nineteenth-century Gothic and crime writers with their interest in the marginal and the uncanny sides of the physical world.

Messy Practices

If Gothic and crime fiction and evidence from memoirs and medical schools reveals how laboratory knowledge could be fashioned in a range of often *ad hoc* and domestic spaces, what about the material culture of the laboratory? Historians have frequently privileged ideas and texts over practice – after all texts "survive, are readily traceable, available and reproducible" (Cooter and Pumfrey 255). De Solla Price has criticised

what he labels this "papyrocentricity," but part of the problem stems from the silences in the scientific texts themselves (169). As the French physiologist Claude Bernard explained in 1865: "One must be brought up in laboratories and live in them, to appreciate the full importance of the details of procedure in investigation" (qtd. in Latour, "Costly Ghastly Kitchen" 295). Much earlier in the nineteenth century, Shelley describes Frankenstein's engagement in the "theory and practice of natural philosophy", his observations in morbid anatomy, and how he "collected the instruments of life around him," but glosses over the actual practice of creation (48-55). Although Frankenstein claims to spare the reader from "destruction and infallible misery" (51), similar silences exist in medical journals. Here we only read about the end versions of the experiments undertaken rather than what went on inside the laboratory. In these papers, failed experiments or the difficulties encountered are seldom mentioned. If some bacteriological findings were later confirmed as erroneous – for example, the bacteriologist Edward Klein's work on the typhoid 'microphyte' – the papers themselves had a triumphant tone of new discoveries (Worboys, *Spreading Germs* 135, 152). By shifting our gaze from these papers to different types of texts, insights can be gained by reading the signs of laboratory practice rather than those of the subsequent experimental results.

If laboratory knowledge represented only one version of scientific medicine, rather than a form of scientific medicine that all Victorian and Edwardian doctors were progressing to, how was that laboratory knowledge constructed? Whereas Holmes' scientific "cold-bloodedness" in *A Study in Scarlet* produces controlled and "rather bizarre" experiments in the dissection room and the chemical laboratory that reflect the detective's pursuit of exactness (3), experimentation was often a messy business. This is revealed in Stevenson's *Jekyll and Hyde*. As Wilde explains in "The Decay of Lying" (1889), *Jekyll and Hyde* reads "dangerously like an experiment out of the *Lancet*" (295). Initially Jekyll discovers powerful "transformative agents" through a process of self-experimentation, but when he tries to recreate his experiment, the reader learns how Poole has "been sent flying to all the wholesale chemists in town." Poole explains to Utterson how "every time I brought the stuff back, there would be another paper telling me to return it, because it was not pure" (58). Later on in Jekyll's account, we hear how his "draft" contained some "unknown impurity" that lent it efficacy but could not be found again (106). When Jekyll's estranged friend, the doctor Hastie Lanyon enters Jekyll's cabinet, he finds notes revealing "a series of experiments that had led (like so many of Jekyll's investigations) to no end of practical usefulness." In his notes, Jekyll exclaims "total failure!!!" (75). Whereas the novella has been presented as an examination of addiction, Jekyll's "total failure" can equally be viewed as a commentary on contemporary anxieties about the dangers of adulteration, impurity, and the identity and hence safety of certain common foods and drugs (Wright; Hammack). Gothic writers were fascinated by questions of identity and the idea that outward appearances concealed something sinister within, as highlighted by the presence of the doppelgänger in *Jekyll and Hyde* and *The Picture of Dorian Gray*. If similar concerns about 'identity' occupied public analysts and doctors, Jekyll's failed experiments also demonstrate the crucial components of experimentation missing from retrospective scientific narratives. They draw attention to how experimentation often proceeded by trial and error, how contamination presented considerable problems for experimenters, and how experiments frequently failed.

A similar process of experimentation is evident in other Gothic fictions. Although in Nesbit's "The Three Drugs" the experimentation appears to be more controlled, at least until the doctor takes his own medicine, Wroxham is told of earlier experiments on animals and about "the others" – human subjects whom the doctor found "unsound" (52). The obvious reference here is to controversial physiological and other forms of animal experiments, concerns that had already been explored by authors such as Wells in *The Island of Dr. Moreau*. Although there is only fragmentary evidence to support contemporary accusations of human experimentation, between 1903 and 1910 questions surrounding the use of vivisection were a subject of intense debate following allegations that William Bayliss of the Department of Physiology at University College London had performed illegal vivisections on a brown terrier dog before an audience of medical students.¹ The resulting controversy saw pitched battles between medical students and the police, a libel trial, and the appointment of a royal commission on the use of animals in medical experiments (Lansbury). If fears about vivisection and the controversial use of animals in a wide range of medical experiments give the immediate context for Nesbit's narrative, "The Three Drugs" equally suggests an experimental process in which errors are common. Nesbit further writes in "The Five Senses" of how "these things [experiments] take years," and points to "that sort of frenzy of experiment" to which "no scientific investigator is wholly a stranger" (157). In the story, the well-know scientist Boyd Thompson gives up his antivivisectionist fiancé for his work. At the heart of the narrative are experiments that lead to the discovery of five elixirs that enhance the senses and a mistake that governs what unfolds as Boyd Thompson is rescued by his estranged fiancé from being mistaken for dead. In describing how Boyd Thompson "could not lay his hand on the thing he wanted," Nesbit alludes to the do-it-yourself nature of laboratory practice, which, as we shall see below, was a feature of contemporary laboratory medicine (157).

The practice of self-experimentation revealed in these fictions was not uncommon. As Conan Doyle explained in a letter to his mother in 1879, "I have been experimenting upon myself with Gelsemium . . . I increased the dose until I reached 200 minims, and had some curious physiological results" (Lellenberg et al 117).² However, the similarities do not stop there. In the medical laboratory, investigators were regularly confronted with similar problems in their experiments to those described in Gothic fictions as they worked in spaces that were both social settings and problematic places.

The period after the discovery of the tubercle bacillus in 1882 to end of the century saw a 'Bacteriomania', but it was also a time when a blood count or testing for sugar in urine was, as one physician remembered, "something of an event" (Campbell Thomson 71). If textbooks outlined apparently idiot-proof methods, in reality laboratory practices, especially those connected to the new sciences of bacteriology and pathology, were beset with problems. Notwithstanding the exhaustive detail provided in textbooks on questions of purchase, the installation and the operation of instruments or the conduct of experiments, which endeavoured to communicate new skills to doctors, the particulars were not always replicable.³ It is important to remember that everyone in the 1880s, even the more experienced, were in a sense an amateur. Training in laboratory methods was rudimentary: as the pathologist Louis Cobbett remembered, in the London hospitals bacteriology was "scarcely mentioned" until the 1890s (Weatherall 182). Microscopes may have been familiar and the ability to grow bacteria may have seemed easy, but laboratory science

was a new science in the late-nineteenth century, one that had to be learnt. For example, in his work on typhoid cultures, Wright had to devise new techniques for estimating the bactericidal power of the serums he was investigating, including methods for aseptically collecting small samples of blood (Colebrook 34). Although early methods might have appeared simple in print, difficulties were encountered. Instruments, such as syringes, were crude: as one Edwardian student remembered, to make syringes watertight required winding thread round them (Colebrook 27). Even experienced researchers admitted that they were "awkward to handle at first" (Dowson to Cobbett, 11 May 1903). Work on culturing bacteria involved literally counting the bacilli under a microscope, a process that could last hours and result in "severe eye strain" (*Second Report* 7). Experiments, just as in Nesbit's "The Five Senses", could "take years" given the skills that had to be mastered (157).

Although techniques in microscopy, culturing bacteria, and inoculation were refined in the 1890s, problems persisted which determined the nature of laboratory practice. Admittedly, the "days of the dabbler" had ended as the first generation of full-time bacteriologists was appointed, but comparisons with *Jekyll and Hyde* still hold in the Edwardian period (Worboys, *Spreading Germs* 216). Writing about what went on in the laboratories of the Inoculation Department at St Mary's Hospital, one contributor to the hospital's *Gazette* referred to the workers as "Modern Mrs Beeton's" (*St Marys Hospital Gazette*, 1906). *Mrs Beeton's Book of Household Management* (1861), the popular guide to running a middle-class Victorian household, contained, among other things, advice on poisons, science and managing servants, as well as over 900 recipes. Comparisons of early physiological and bacteriological practices with recipes are appropriate: Bernard in 1865 described his work in a physiological laboratory as being akin to passing through a "long and ghastly kitchen" (Latour, "Costly Ghastly Kitchen" 295). Not only did bacteriological laboratories often occupy domestic spaces, but also work in them often had a decidedly domestic feel. Bacteriological samples were initially grown on potato skins and the manufacture of cultures resembled a recipe. For example, in explaining how to produce cultures of tuberculosis, Walter Dowson, director of the Wellcome Physiological Research Laboratories in London, provided the following information for a suitable "broth" on which to grow the bacillus:

Broth for T.B.

Fresh lean Veal – 500 grams.

Cold tap water – 1 litre.

Peptone 2%	}
Salt -5%	
Glycerine 4%	
-----	Reckoned on one litre

Neutral to litmus

Mince veal. place in boiling pot. add the water. slowly raise to boiling point (about 1 ½ hours). boil for 20 minutes. strain and filter. Pour back into pot. add peptone, salt, and glycerine. boil 20 minutes. make up to one litre. neutralise. boil another 10 minutes. filter and sterilise.

As Dowson noted of his recipe – “shade of Mrs Beeton” (Dowson to Cobbett, 26 March 1903) – Bacteriologists’ notes reveal how they swapped recipes in much the same ways as households did. This association with cookery and the kitchen might imply a feminisation of experimentation and, like Stevenson’s *Jekyll and Hyde*, a critique of science and the laboratory’s claim to rationality. On the surface, such analogies appear to contradict representations of institutional laboratory facilities as masculine and heroic and places of moral and physical courage (Jones 178). However, laboratories, and especially medical school laboratories, were intensely homosocial spaces where experimental successes were often communicated through displays of national pride and virility. This is evident in Conan Doyle’s use of the laboratory in *A Study in Scarlet*. Not only is the laboratory here entirely inhabited by men, but it is also a place of manly display: Holmes’ scientific approach is described in masculine terms as cold-blood, accurate, exact and dispassionate (2). Rather than reflecting the laboratory as a feminine space, allusions to cookery reveal the ambiguities in how the medical laboratory was regarded as a place where knowledge was generated. The references to ‘Mrs Beeton’ served to trivialise the work undertaken in the laboratory and made it appear less threatening and complex. The associations of the laboratory with cookery reveal the ambiguous position of laboratory knowledge in medicine: laboratory workers were able to identify themselves as thoroughly masculine but could also be represented as ‘Modern Mrs Beetons’. In mediating ideas of masculinity and femininity and pointing to the multiplicity of laboratory knowledge, a trope familiar to Gothic writers, this ambiguous portrayal of laboratory work and workers was reassuring for doctors grappling with new forms of knowledge. By mirroring and reinforcing the laboratories’ domestic nature, these representations reflected how in late-Victorian and Edwardian medicine the laboratory was assigned a subordinate role to clinical judgement.

Further insights into the messy nature of experimentation can be found in the correspondence and minutes related to the state-funded bacteriological experiments conducted between 1890 and 1913 for the royal commissions on tuberculosis. These provide what Frederic Holmes has described as evidence of the “investigative pathways” that went into defending a British paradigm of tuberculosis (235). The royal commissions were established to ascertain the connection between tuberculosis in animals and the disease in man, and the extent of the risk to human health. As I have shown elsewhere, the commissioners defined tuberculosis as a “public health problem amenable to laboratory investigation” (Waddington 355). They placed their faith in bacteriology to provide authoritative answers to the questions surrounding the nature of bovine tuberculosis and contagion, and consequently the commissions invested in a programme of research that was to last until 1913. The bacteriological investigations undertaken for the commissions demonstrate the difficulties encountered in producing laboratory knowledge. They reveal how germs – like Jekyll’s transformative agent – were uncooperative objects for study.

From the outset, problems were encountered in the experiments organised for the royal commissions as the investigators went along in an environment where, as one commissioner explained, “we cannot be sure of our ground here” (Foster, Memorandum). For example, no effort was initially made to assess how many bacilli were present in the cultures used. It was only by the time of the third commission that this failure to determine how many bacilli were being injected into the experimental subjects was seen as problematic as questions were gradually asked about virulence (*Second Report* 7). Yet precise measurements were considered impossible as the

cultured bacilli were "tightly glued together." Instead of raising doubts about validity, the commissioners overlooked the issue (*Second Report* 8; Minutes, 28 March 1904). Just as Jekyll found, difficulties were equally encountered with contamination. The report of the first commission (1890-1895) highlighted the "egregious irregularities" arising from contamination of culture and sputum samples, which causes problems (*Royal Commission, Inquiry II* 10-31). For the third commission (1901-1913), contamination was a constant problem. Consequently, errors crept in and experiments had to be repeated or ignored (Memorandum, 1903; Griffith, "Notes").

Problems were not just practical in nature. Internal politics and jealousies shaped investigations. Just as Lanyon disagreed with Jekyll over the nature of science, infighting between the researchers for the royal commissions led to them spending time "making experiments with a view to upsetting theories held by the other" (Minutes, 26 January 1903). These disagreements created problems: much time and money was wasted. Although Edward Steegmann, secretary to the third royal commission, told the investigators in 1905 that "it would be an impertinence for me to try to influence your scientific opinions on purely scientific matters", the message was clear (Steegmann to Cobbett, 11 October 1905). The investigators were informed that "only such results as were of a positive nature and from which definite conclusions could be drawn" were to be reported (Minutes, 27 November 1905). Just as in Gothic fictions, laboratory knowledge was contingent on the problems encountered, but it was also shaped by the politics involved.

Conclusions

Work on the history of science suggests that authorised or elite science protects its authority by controlling both the physical and the social spaces in which it occurs, assuming that science is pursued in a specific place. The location of science was a crucial question for nineteenth-century practitioners, but this did not mean that these spaces were removed from the private or the domestic. As *fin de siècle* Gothic and crime fictions and other sources reveal, legitimate laboratory knowledge in medicine could be produced in a range of settings, which included the domestic and the informal. Medical sciences, such as pathology, bacteriology and pharmacology, could be central to new ways of constructing medicine but at the same time occupy marginal spaces. The spaces medical laboratories often inhabited and the messy nature of experimentation therefore had more in common with literary representations than our usual images of the laboratory associated with the "laboratory revolution." Although such sites were gradually marginalised in the Edwardian period as medical schools invested in purpose-built laboratories, the points of convergence suggest that although what went on inside the laboratory produced unease, both within and outside of medicine, laboratories were in some senses familiar places. Images of laboratory science therefore found a clear resonance in Gothic representations of the laboratory and their incorporation of the recognisable places and paraphernalia of experimentation. Much laboratory work was performed on a do-it-yourself basis and, just like Jekyll's and Boyd Thompson's experiments, was prone to errors. On the one hand the do-it-yourself nature of experimentation allowed laboratory knowledge to be constructed in a range of spaces, from the ward to cupboards and attic spaces, but on the other it also reflected the fact that many investigators were developing and mastering new ideas and techniques, often by trial and error. The do-it-yourself nature of laboratory practice was initially presented as a virtue: laboratory medicine was something that practitioners could undertake in the corners of domestic rooms, in

doctors' surgeries, or in teaching hospitals. If this do-it-yourself approach had been largely eroded by the 1910s, the laboratory revolution was very domestic in origin. Indeed, it was often more like cooking than science.

Notes

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1. Weale and Scapel [Berdoe] present the possibility of human experimentation in London's teaching hospitals as a common practice. This is echoed in fictional form in Moore and Tressell. Published cases were far less common, however: see Duckworth 216-27; Lansbury 59.

2. Gelsemium was distilled from Jasmine and was used to treat neuralgia.

3. For example, see Giggs; Klein; Woodhead and Hare; Cheyne; *Lancet* 1 (1901): 609-11.

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