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‘A New Kind of Rays’: Gothic Fears, Cultural Anxieties and the Discovery of X-rays in the 1890s

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Abstract

In 1895, the world of modern physics was effectively ushered in with the discovery of X-rays by the German physicist, Wilhelm Conrad Röntgen. X-rays rapidly changed the ways in which the human body was perceived, and their discovery was documented and fiercely debated in scientific articles, newspaper reports, literary writings, cartoons and films. This article examines a range of these responses, both 'scientific' and 'popular', and considers the particular significance of their repeated recourse to the Gothic and the uncanny as a means of expressing both excitement and disquiet at what the new X-ray phenomenon might mean.

Keywords: X-rays; Wilhelm Röntgen; 1890s science; body; Gothic; uncanny; cultural response

In the mid-1890s, the Grand Café on the Boulevard des Capucines in Paris became a focal point for new thinking about modernity and the modern world. For it was here, in the Café's Salon Indien, that Auguste and Louis Lumière first demonstrated their moving pictures to a viewing audience on 28 December 1895. From their *cinématographe*, a camera which also served as film developer and projector, they showed ten black-and-white films, including their first production, *La Sortie de l'Usine Lumière à Lyon* (*Workers Leaving the Lumière Factory*), *La Voltige* (*Horse Trick Riders*), *Les Forgerons* (*Blacksmiths*), and the street scene,

La Place des Cordeliers à Lyon (Cordeliers Square). Each film was hand-cranked through the projector with running times about forty seconds long, the maximum length of the reel. Yet for the viewers, the *cinématographe* ushered in a new sense of visual speed, both in terms of action and moving bodies, allowing them to experience a world that was at once both familiar and strangely unfamiliar. As Stephen Bottomore has argued, this early cinema, with its ‘uncanny realism’, was rooted in a whole set of destabilising and defamiliarising effects which ‘enabled a person to stand outside of himself [*sic*] and see again an event he had already experienced’.¹

A few months later, another defamiliarising optical event took place in the Grand Café: the demonstration by the German physicist Wilhelm Conrad Röntgen (1845-1923) of his new X-ray process.² As spectators crowded into the Salon to see their bones cast as shadows onto a screen – literally to see the interior of their live bodies projected before them – nothing less than the emergence of a new world of modern physics was being enacted. Within a short space of time, X-rays would become one of the most significant diagnostic and therapeutic tools of modern medicine and important to the development of nuclear physics, quantum mechanics, and molecular biology. At the time of the Grand Café demonstrations, however, what these alternative optical technologies offered in relation to the visibility of the body could hardly be more stark. For whilst the early films tended to emphasise the corporeality, energy and dynamism of the body, the X-rays resulted in a kind of reduction process whereby the body’s fleshy substance was stripped away to leave an image of what would remain after death and decomposition had taken place: the skeleton. Both technologies were perceived as somehow ‘magical’ – a category which, as Leigh Wilson has shown, was central to much modern(-ist) thinking in the late-nineteenth and early-twentieth centuries – but their visual effects were very different and consequently so was their wider cultural reception.³

In this essay I examine various aspects of the immediate reception of Röntgen's discovery as it was mediated in a range of different texts – Röntgen's own papers, scientific articles, newspaper reports, literary writings, cartoons and films. I am particularly interested here in the manner in which responses to Röntgen's breakthrough in the late-1890s repeatedly had recourse to the language and imagery of the Gothic and the uncanny. Time and again, accounts of the X-ray process collapse together scientific, medical and Gothic discourses as commentators sought to come to terms with the body being opened up and exposed in both exhilarating and disturbing ways. Disrupting the perceived boundaries between inner and outer, viewer and viewed, organic and inorganic, even life and death, the technologies of X-rays challenged seemingly-settled categories. Moreover, as I demonstrate, the often Gothicised responses to Röntgen's discovery – as with any number of 1890s literary Gothic texts – were contingent upon, and heavily intertwined with, a wider set of contemporary anxieties concerning scientific 'progress', subjectivity, visibility and surveillance, propriety, invasion, and the processes of boundary loss.

In his essay on Röntgen published in 2000, Jürgen Teichmann observed that there had been little critical analysis to date of what he termed the 'Röntgen craze'.⁴ This situation has started to change in the last fifteen years, particularly through the work of scholars such as Adrian Thomas and Arpan Banerjee, Lisa Cartwright, Steven Connor, and Bettyann Kevles, each of whom have offered insightful readings of aspects of the impact of Röntgen's discovery with which I engage in this essay. By focusing on a rather different range of sources, however, and by juxtaposing both scientific and popular responses, I seek to show how the language and imagery of Gothic repeatedly crosses disciplinary and genre boundaries at a particular moment of scientific excitement and dis-ease. To frame this enquiry, my starting point is Röntgen's initial experiments and their relations to textual configurations of laboratory Gothic.

As Robert Purrington has documented, by the second half of the nineteenth century a process of rapid institutionalisation and professionalisation of physics was occurring in Germany. Teaching laboratories and professional associations were developed (both of them, as Purrington notes, German initiatives); research laboratories and institutes were established; and, by the 1890s, a massive watershed was underway as ‘the edifice of classical physics...began to crack...under the weight of new unsolved problems and new discoveries.’⁵ The work of Wilhelm Röntgen was in many ways at the leading edge of this transition. In 1888, Röntgen was appointed to the chair at the University of Würzburg’s Physical Science Institute, where he worked in many of the major branches of classical and experimental physics (he had little time for the developing field of theoretical physics). In the mid-1890s, he became drawn to experiments with cathode rays and, seeking to develop the work of Heinrich Hertz and Philipp Lenard, he began to test the effects of passing a high-tension electrical current through a glass vacuum tube in order to observe what light emissions were generated. As Otto Glasser notes in his foundational study of Röntgen, the apparatus he used was relatively simple – a Hittorf-Crookes tube, a Ruhmkorff induction coil, and a mercury interrupter – and yet the results were anything but.⁶ For in the late afternoon of 8 November 1895, Röntgen’s work led him into a whole new terrain. As he put his laboratory into complete darkness and closed the switch on the conductor, he was puzzled to see a glow emanating from a fluorescent screen about a metre from the apparatus. Since cathode rays are unable to penetrate more than a few centimetres of air, and so could not reach the screen, Röntgen began to speculate that a different kind of ray was causing the phenomenon.⁷

It was an astonishing moment of chance observation. Röntgen quickly proceeded to test the power of the rays to penetrate solid objects – paper, wood, metals – and found that only lead seemed to stop the rays completely. Then, as he held a small disk of lead between the tube and the screen, what occurred was nothing less than the (Gothicised) birth of medical

imaging. For along with the outline of the disk on the screen there appeared the outline of Röntgen's thumb and finger, and within the darker area he saw the outline of the bones of his hand. As W. Robert Nitske suggests, Röntgen was suddenly exposed to 'his own skeleton still encased in live tissue, his fingers casting long ghostly black shadows'.⁸

What followed was arguably Röntgen's most important period of research, which carries all the hallmarks of a laboratory Gothic narrative. As Martin Willis has detailed in his discussion of H.G. Wells' *The Island of Doctor Moreau* (a text which appeared in the same year – 1896 – that news of Röntgen's discovery was quickly circulating), the 1890s witnessed considerable suspicion in the public mind about laboratory science, and especially the work that might be conducted in a private laboratory as opposed to a public laboratory with an assistant in attendance.⁹ Effectively, Röntgen's laboratory can be read in these terms for despite the fact that it was an institutional space, it quickly became transfigured into a private space of obsessive experimental practice. Over an intense six-week period, Röntgen worked in absolute secrecy, descending from his family's living quarters in the physics building to his laboratory below – a marked move between seemingly gendered spaces – and relentlessly repeating and developing his experiments. When the students left for the Christmas vacation, he often ate and slept in the laboratory, rapidly becoming a version of the monomaniacal scientist which Glennis Byron highlights as 'the primary figure' in many 1890s Gothic works.¹⁰ Not even his assistants or his family were aware of the work Röntgen was undertaking, for as he told his daughter, deploying a startling image of the laboratory as haunted space, he preferred to work when 'keine dienstbaren Geister' ('no subservient ghosts') were present.¹¹

Röntgen later reflected on this period in a passage which both emphasises the intensity of his psychological state at the time and, in keeping with many written responses to the

discovery, situates ambivalent feelings of sensation and anxiety at the heart of the scientific process:

When at first I made the startling discovery of the penetrating rays, it was such an extraordinary astonishing phenomenon that I had to convince myself repeatedly by doing the same experiment over and over and over again to make absolutely certain that the rays actually existed. I was not aware of anything else but the strange phenomenon in the laboratory. Was it a fact or an illusion? I was torn between doubt and hope, and did not want to have any other thoughts interfere with my experiments.... During those trying days I was as if in a state of shock.¹²

‘Startling’, ‘astonishing’, ‘strange’: such language of the uncanny and the unknown (seemingly unknowable?) would quickly become central to the reception of the discovery, but it was already there in the scientist’s own articulation. The laboratory, already identified as a kind of haunted space, is increasingly also the space of ‘strange phenomen[a]’.

Over the following weeks, Röntgen worked with photographic plates in order to produce permanent records of what he witnessed. As he noted in his preliminary report, he sought to ‘exhibit the phenomena so as to exclude the danger of error... [and] thus confirm many observations originally made by eye observation’¹³ – a key concern given how intricately X-rays became bound up with the possibilities and limitations of seeing. Arguably, these photographic plates might themselves be read as Gothic texts according to some of the criteria outlined by Kelly Hurley: that they possess an element of sensationalism; depict supernatural or seemingly supernatural phenomena; and often engender a strong affective response.¹⁴ Moreover, as the images bring into view that which is usually hidden away, they might also be thought to enact a kind of haunting, articulating that ‘absent presence’ which

conflates self and other in a 'moment of spectrality', as Andrew Smith puts it.¹⁵ Certainly, the (in-)famous first image of the hand of Röntgen's wife, Anna Bertha, produced by a fifteen-minute exposure on 22 December 1895, beautifully encapsulates the contemporary sense of the possibility and anxiety around X-rays.¹⁶ The image eradicates the flesh of Anna's hand to leave the phalanges, joints and metacarpal bones exposed, her wedding ring prominently encircling the fourth proximal phalange. It is an unsettling photograph by any standards, collapsing together the traditional symbol of the institution of marriage and a dominant image from traditional Gothic narratives. This juxtaposition consequently makes an implicit linking between marriage and death and foregrounds all that will remain – bones and metal – in the grave. The image thus has the power to manipulate not only matter (the effective removal of bodily form and substance) but also time and the ageing process. For as Steven Connor argues, X-rays offer 'a glimpse of our future postmortem condition...making it grimly manifest that we already are the skeletons to which we will one day be reduced'.¹⁷ This was clearly all too evident to Anna who reportedly commented when looking at the photograph, 'Ich habe meinen Tod gesehen': 'I have seen my own death'.¹⁸ Indeed, such a prevision would be repeatedly played out as the photograph of Anna's hand quickly became one of the most reproduced images of the late-1890s, effectively transferring the Gothic associations of the X-ray process from Röntgen's 'haunted' laboratory to an international audience.¹⁹

As many historians of X-rays have noted, the dissemination of Röntgen's discovery was remarkable for both its speed and geographical reach. Within just seven weeks from his first observations, Röntgen had written his initial report, 'Über eine Neue Art von Strahlen' ('On a New Kind of Rays'), and persuaded the Würzburg Physical-Medical Society to publish it in the 1895 volume of their Minutes. He also had copies of the report printed so he could send them to prominent scientists, a number with examples of his Gothicised images. Although probably not a conscious act, but one which is culturally significant in hindsight,

Röntgen bound these reports in yellow wrapping – that colour so often associated with transgression and challenge to established moral and social order in the 1890s. Indeed, setting out to mail the reports on New Year's Day 1896, Röntgen tellingly remarked to his daughter, in a phrasing that recalls the Faustian over-reacher connected with many nineteenth-century literary scientists, 'Nun wird man dem Teufel zahlen müssen': 'Now the devil will have to be paid.'²⁰

Interestingly, given the parallel emergence of visual technologies with which I opened this essay, Röntgen's preliminary communication was submitted to the Society on the same day that the Lumière brothers demonstrated their moving pictures in Paris. It was then rapidly translated into English, French, Italian and Russian, and was in its fifth edition by the end of February. By this time, however, Röntgen was already internationally famous, for after an initial article appeared in the Austrian newspaper *Die Presse* on 5 January 1896, under the title 'A Sensational Discovery', the story was cabled and reported worldwide. Röntgen received letters of congratulation from key contemporaries such as Lord Kelvin, Henri Poincaré, Thomas Edison, Marie Curie and Albert Einstein, and the scientific community subsequently went into overdrive, repeating his experiments and looking to advance both the precision and quality of the images.²¹ Astonishingly, 1896 saw the publication of no less than 49 books and pamphlets on X-rays, and over 1000 articles and papers, as the process was quickly taken up for identifying bone fractures, locating foreign bodies such as needles or bullets, and providing visual evidence in medico-legal cases.²² Indeed, the discovery of X-rays – which Röntgen had named after the mathematical convention for an unknown quantity but which soon also became known as Röntgen rays – had effectively enabled, in Stanley Reiser's analysis, the introduction of 'the transcendent instrument of visualization in medicine' which had the capacity to 'obliterate one distinction between the outer and inner spaces of the body – both were now susceptible to visual examination'.²³

Given this emphasis on the ‘obliteration’ of boundaries and categories, it is unsurprising that a sense of the Gothic hovers around both scientific practice and discourse in relation to Röntgen’s discovery. The references in scientific journals often assimilate the language of sensation and the fantastic in assessing the new rays, as seen, for example, in the title of *The Electrical Review*’s article, ‘How to Photograph and See Through Opaque Bodies’ (March 1896), and the emphasis in the *British Medical Journal* (February 1896) on ‘the photography of hidden structures’.²⁴ Moreover, as the world of anatomy was rapidly becoming redefined, both the scientific and non-scientific communities were complicit in the drive to push X-ray imaging as far as it could go – often with results that moved into the realm of the grotesque with its emphasis on the bizarre, macabre and distorted, and the attendant experiences of surprise, alienation, and repulsion. The incongruities inherent in the concept mean, as Justin Edwards and Rune Graulund have detailed, that ‘the grotesque does not inhabit a stable or predetermined ground’ but often tends towards ‘indeterminacy...where the emphasis is on anxiety as much as it is on creativity.’²⁵ This incongruity and intermingling of anxiety and creativity is certainly captured in the attempts in the 1890s to produce increasingly excessive X-ray images. Glasser documents a note to a photographer in 1896, for example, where a customer complains about images of a foot with a needle embedded in it which he has been sent: ‘Photograms received, very tame. Send more sensational ones, such as interior of the belly, back bones, liver, kidneys, head, lungs, etc.’²⁶ X-rays of amputated limbs, conjoined twins, mummified children, and pinned-out birds, fish and lizards began to be produced and circulated. And in America, Edison even attempted to take an X-ray of the human brain but found the bones of the skull too dense for the rays to penetrate at that time.²⁷ Such pushing for more extreme images consequently situated the X-ray process on the (highly unstable) border between scientific/medical development and the

thrill of voyeurism. For the grotesque can, of course, be both intensely disturbing and intensely attractive.²⁸

In an article published in *Medical News* in 1896, Henry W. Catell, demonstrator in morbid anatomy at the University of Pennsylvania, summed up a dominant scientific attitude to X-rays whilst contemplating one of the hand X-rays ('bone portraits') which were currently flooding the market:

The surgical imagination can pleurably lose itself in devising endless application of this wonderful process. If it becomes possible to drive these mysterious rays through the entire body as clearly as they now penetrate the hand, the realm of utility will be practically boundless.²⁹

What is intriguing about this passage is again the scientist's recourse to the language of wonder, mystery and unfathomable possibility. The 'surgical imagination' – an astonishing phrasing which seemingly brings together the rational and fantastic, practical and visionary, Enlightenment and Romantic ideals – will be able to deploy Röntgen's work in any number of configurations. Certainly, the new ability to enter the body without cutting the flesh meant that internal anatomy no longer needed to be experienced solely via surgery or dissection – an argument which was quickly adopted by the anti-vivisection movement in further promotion of their cause.³⁰ Yet embedded in Catell's phrasing is also a language of power and control as the scientist 'drive[s]' the rays which 'penetrate' the body's boundaries. Such language is consistent with that found in contemporaneous accounts of colonial and urban exploration (for example, in the writings of H. Rider Haggard, Joseph Conrad and William Booth³¹) or in early accounts of psychoanalysis (it is intriguing that Röntgen's process of 'uncovering' the interior body emerged in the same year as Sigmund Freud and Josef Breuer's process of

‘uncovering’ what lies hidden in the mind, in *Studies on Hysteria*). Indeed, the medical/scientific practitioner in Catell’s description effectively removes the agency of the recipient of the X-rays, in a way which recalls Michel Foucault’s analysis of the power differentials embedded in medical diagnosis and treatment in *The Birth of the Clinic* (1963; trans. 1973). It was this set of anxieties – regarding power and control, the permeability of body boundaries, acts of penetration, and the perceived disruption of system and order – which then threaded through the more popular responses, both serious and comedic, to which I now turn. For the language and imagery of Gothic and the uncanny which haunts even the most obviously scientific papers in these early years of X-rays arguably becomes the dominant discourse in popular responses for the rest of the decade.

In her discussion of *fin-de-siècle* Gothic texts such as *Dr Jekyll and Mr Hyde* and *The Great God Pan*, Kelly Hurley has drawn attention to a process whereby ‘seemingly supernatural phenomena are produced *through* scientific practice.’ For Hurley, such scientific practice is a ‘liminal art – an empiricist discipline that produces, or describes, phenomena that could best be described as “Gothic”’, and one which consequently foregrounds ‘the unpredictable strangeness of the natural world and the bizarre, shifting nature of the human subject itself’.³² In many ways, this analysis can also be applied to the ‘real’ practice of X-ray production in the 1890s and the multiple cultural responses that it engendered. For the practice of this ‘liminal art’, to use Hurley’s phrase, was quickly embraced not only in scientific circles but also in public demonstrations, displays, fairs and entertainments of all kinds. The X-ray equipment was relatively cheap and the process easy to perform, and the effects were almost always guaranteed to be ‘strange’ and ‘bizarre’, particularly to the lay viewer/participant. The process of making the invisible visible was therefore itself highly visible in a range of situations and venues. Indeed, as Gillian Beer has suggested, X-rays entered into a particularly fraught moment in the late-nineteenth century when, across social,

intellectual and discipline boundaries, '[t]he invisible...became a site of debate and perturbation.'³³

A useful starting point for bridging the gap – itself relatively small – between 'scientific' and 'popular' responses to X-rays in the months following the announcement of the discovery is an interview with Röntgen conducted by Henry J. W. Dam, which appeared in *McClure's Magazine* in April 1896. *McClure's* was an American illustrated monthly journal, founded in 1893 as part of the magazine revolution in the States which catered for an increasingly-educated middle-class readership. It became known for its articles on developments in science and Dam contributed pieces on topics as varied as the Maxim airship, the structure of volcanoes, the chemistry of poisons, and the search for absolute zero.³⁴ On the announcement of Röntgen's discovery, Dam was quickly dispatched to interview the scientist – the only interview Röntgen undertook – which he then published under the title 'The New Marvel in Photography'. The interview is clearly written by a man fascinated by laboratory science, but it is also shot through with anxiety about this 'discovery so strange that its importance cannot yet be measured...or its ultimate effect upon long-established scientific beliefs be even vaguely foretold'.³⁵ For as he is invited by Röntgen to sit in a portable, four-foot-square dark room so he can see the effect of the rays, Dam reflects on how the rays are obviously also passing through his own body: '[t]hrough the metal plate, the paper, myself, and the tin box, the invisible rays were flying, with an effect strange, interesting, and uncanny.'³⁶ The result is to make him 'not altogether certain whether my skeleton was to be photographed for general inspection, or my secret thoughts held up to light on a glass plate'.³⁷ Here, the anxiety of personal intrusion and exposure which runs through many of these early responses extends beyond the body to the mind as well. The rays are able to penetrate the flesh, so why not the mind, its memories and its thought processes? Indeed, as Bettyann Kevles has emphasised, early X-ray technology 'threatened to expose the two

holiest sanctums of the human body – the sex organs and the brain’.³⁸ Interestingly, Dam takes this concern even further at the close of the interview when he seemingly collapses together the new technology and Röntgen himself. For when he asks Röntgen if he can take a photograph of him, Dam notes: ‘The rays from the Röntgen eyes instantly penetrated the deeply hidden purpose. “Oh, no,” said he; “I can’t let you make pictures of me. I am too busy.’”³⁹ Here organic and inorganic appear to coalesce, in a strangely Wellsian way, as Röntgen is reconfigured by Dam as the man with X-ray eyes, that figure who would become, as Connor has explored, one of the inevitable fantasy outcomes of Röntgen's discovery.⁴⁰

When Dam’s article was published, it was accompanied by nine X-ray photographs (*McClure’s* was known for its strong photographic content⁴¹), including images of cigars photographed inside a cigar case, a foot photographed through a shoe, the skeletons of a fish and a frog photographed ‘through the flesh’,⁴² and that now almost obligatory image of a woman’s hand which, as Lisa Cartwright suggests, was quickly becoming something of a fetish.⁴³ For as Dam notes in his piece, here was ‘the opening into a new and unknown field of physical knowledge’. With a more anxious undercurrent, however, he also emphasises that ‘[e]xactly what kind of a force Professor Röntgen has discovered he does not know’.⁴⁴ In many ways, then, Dam’s article – pervaded as it is with Gothic and uncanny resonances – conforms to Bernard Lightman’s analysis of the strategies used for popularising science in the nineteenth century. For as Lightman notes of writers like Dam, ‘[t]heir success... was partially due to their ability to present... scientific fact in the form of compelling stories, parables, and lessons, fraught with cosmic significance.’⁴⁵ Further, and importantly for the remainder of this essay, Lightman draws attention to the fallacious idea that ‘popularization is merely a simplification of pure knowledge’, a line of thinking which ‘uncritically assumes the existence of two independent, homogenous cultures, elite and popular’.⁴⁶ This idea can be circumvented by a more complex model of multiple interactions, where the ‘popular’

contributes not only to the dissemination of knowledge but also to the formation of that knowledge. Indeed, this is a concept which has interesting parallels with the political and cultural work undertaken by a more ‘popular’ genre like Gothic itself. Certainly, there is an intriguing nexus of ideas here in the frequent deployment of Gothic-inflected imagery in many of those popular works which effectively disseminated and constructed the knowledge of X-rays in the last years of the nineteenth century.

One of the most striking manifestations of these complexities in visual form is a frequently-cited but little-analysed cartoon published in *Life Magazine* in February 1896. Entitled ‘The New Roentgen Photography: “Look Pleasant, Please”’, the cartoon juxtaposes two scenes. On the left, a smiling farmer holding a scythe stands in a pastoral scene, while a man in the foreground operates what looks like a freestanding camera. On the right is an image plate, signed ‘Roentgen, Germany’, which reveals the possible results of this ‘New...Photography’ – an X-ray where the happy farmer is transformed into a full-length skeleton, now holding the scythe at night in the style of the Grim Reaper.⁴⁷ It is an astonishing depiction, the inset Röntgen photograph setting up a whole range of binary oppositions – pastoral/anti-pastoral, light/dark, human/non-human, benign/threatening – which the cartoon as a whole simultaneously works to collapse. The X-ray technology seemingly exposes what lies beneath the notions of nurturing and fertility associated with agriculture and the farmer – nothing less than the devil within, the Jekyll and Hyde-like *doppelgänger*. Intriguing, too, is the explicit displacement of this Gothic Othering back onto Germany – a politically significant act at a time when anxieties about German power were being felt not only in relation to the country’s rapidly expanding science but also its rapidly expanding military and imperial might. A cartoon in *Punch* published the previous month had made this political dimension even more explicit. In this image, Germany’s Kaiser Wilhelm II is depicted watching a figure of the English John Bull being X-rayed. The result in the inset

X-ray photograph is a picture of John Bull's straight (physical/social/political) backbone, an intriguing use of the new visual technology to promote somewhat misplaced British patriotism and offer a warning to the German Emperor.⁴⁸

The visual humour encoded in 'Look Pleasant, Please' was also fundamental to two early filmic engagements with X-rays in the late-1890s. Given the contemporaneous 'launch' of moving image and Röntgen's discovery, it is probably unsurprising that the fascination with X-rays would soon be taken up into the emergent silent film technologies. In George Albert Smith's *The X-Ray Fiend* (1897), for example, a forty-four-second comedy, a couple are depicted sitting on a bench, the man clearly trying to woo the younger woman.

Unbeknown to them, a camera-like machine marked 'X-rays' emerges through a curtain on the right-hand side and transforms the couple, through an early version of the jump-cut effect, into a pair of frolicking skeletons (the actors appear in black outfits with bones printed on them). Humorously, even the 'flesh' of the umbrella which the woman holds is removed to leave the 'bony' structure of the metal spokes. A second shot of rays restores the couple's bodies and the woman subsequently leaves after half-jokingly reprimanding the man for his actions. A few months later, the soon-to-be famous George Méliès, who had been present at the Lumière brothers' first public screening, released his one-minute-long film, *Les Rayons Röntgen*. Although the film appears not to have survived, sources record that it depicted a man visiting a scientist for an X-ray consultation. As they undertake the process, however, rather than merely becoming visible, the man's skeleton escapes his body altogether. Reversing the process again restores the body but the patient unsurprisingly refuses to pay and in the ensuing squabble the X-ray machine blows up and the scientist is killed.⁴⁹

In both films, then, the viewer would have been placed in the position of voyeur as bodies shift, transform, disintegrate and re-emerge. *The X-Ray Fiend* and *Les Rayons Röntgen* were clearly slight pieces which were meant for entertainment and/or production

experimentation purposes, yet their combination of subject and treatment nevertheless points towards that category of ‘comic Gothic’ which, as Avril Horner and Sue Zlovnik define it, translates fear into laughter and deploys Gothic effects ‘not to frighten and appal, but to amuse, to stimulate and to intrigue’. At the same time, however, comic gothic, like its more ‘serious’ counterpart, still has the ability to raise ‘profound questions of belief and identity’.⁵⁰

The complexities of the Gothicised responses to Röntgen’s discovery coalesce in many ways in the final text to which I turn, a short story by C. H. T. Crosthwaite entitled ‘Röntgen’s Curse’. Published in *Longman’s Magazine* in September 1896 and appearing simultaneously in the United States in *The Sacramento Daily Union*, ‘Röntgen’s Curse’ has received little critical attention to date and yet has much to tell us about the relations between X-rays and Gothic at the end of the nineteenth century. Narrated by a bacteriologist and analytical chemist named Herbert Newton, who has worked on cholera in India before returning to England, the text is a version of that laboratory Gothic narrative with which I began this essay. For having read recent accounts of Röntgen’s ‘photography of the invisible’, the somewhat ironically-named Newton is swept up by the scientific excitement and seeks to extend Röntgen’s work further.⁵¹ It is seemingly a fundamental hubris, however, rather than humanitarian concerns, that drives him to find a way of studying anatomy ‘as if [with] the eye of the Creator’.⁵² Indeed, the language of Victor Frankenstein resonates throughout this narrative as Newton fosters the hope of ‘snatching from Nature the secret of life itself’.⁵³ Locking himself away in his laboratory, he develops an X-ray sensitive liquid which he subsequently tests on the eyes of his dog in a scene which clearly gestures towards contemporary anti-vivisection debates. ‘Surely you have not used him for some wicked experiment?’, Newton’s wife angrily demands, as the dog, howling with terror at the sight of any human, exits the narrative to die.⁵⁴ It is when Newton, like Stevenson’s Dr Jekyll, uses himself as test subject, however – when, in Richard Swiderski’s phrasing, ‘[t]he ontology of

the invention overtakes its epistemology'⁵⁵ – that the full horror of his work is realised. For as Newton applies the liquid to his own eyelids, he is plunged into a world where material substance, both organic and inorganic, melts away to leave only metal and bone in view. Most disturbing in the story's textual dynamics is the effective eradication of the family unit and nurturing domestic space, as Newton now recoils from his wife and child whom he views as '[t]wo living skeletons', appearing 'not like the dry bones in a museum of anatomy or in the valley of death' but oddly 'fresh and clammy' with their 'skulls wagg[ing] and mouth[ing] at me in a manner that made my skin creep with disgust'.⁵⁶ So horrifying is the situation, and the attendant realisation that his heretic experiments have 'torn away the veil [of blindness] mercifully spread over our eyes',⁵⁷ that Newton is reduced to a state of psychological collapse from which he is saved only by that Victorian literary convention of the near-death illness and the decisive action of his wife who clears out his laboratory and replaces it with a billiard room seemingly more appropriate for a family gentleman. What survives this (gendered) act of cleansing, however, are Newton's research notebooks, the records of his experiments which he sends to a German scientist friend, Professor Gleichen. Interestingly, as Swiderski notes, the word 'Gleichen' means to equal or resemble,⁵⁸ thereby suggesting something of the *doppelgänger* dynamic between Gleichen and Newton (Gleichen significantly appears to die as a result of rehearsing and developing Newton's experiments). Certainly it is ironic, both in terms of the narrative and scientific history generally, that the 'curse' which Newton engenders through his X-ray work returns to haunt one of Röntgen's own fellow countrymen.

'Röntgen's Curse' therefore highlights a range of anxieties which, as I have suggested throughout this essay, were prevalent to varying degrees in the range of Gothic responses to X-rays in the late-1890s – anxieties regarding scientific development, the nature of knowledge, boundary loss, the dissolution of the human, visibility and invisibility, invasion

and exposure. Nevertheless, these anxieties were also intertwined, as they so often are in Gothic works, with sensations of intrigue, fascination and exhilaration, as commentators were drawn by what Dam termed the ‘contagious arousal of interest’ surrounding X-ray technology.⁵⁹ By the time Röntgen was awarded the inaugural Nobel Prize for Physics in 1901, this Gothicised impulse towards X-rays was beginning to recede, partly because X-rays were no longer perceived as new (although the technology was constantly being developed) and partly because the X-raying process itself was starting to become professionalised into hospital departments and, later, the roles of the radiographer and radiologist. Yet what the ‘Röntgen craze’ helps to confirm once again is the importance of the discourses of Gothic and the uncanny for our attempts to understand, or engage with, new technologies and interventions into science and medicine – particularly when these might radically challenge established ideas about the body and identity. Röntgen’s work in the 1890s helped usher in a modern experience of the world in multiple ways – medically, socially, politically, epistemologically. We should perhaps not be surprised, then, that many of the immediate commentators on X-rays, whether in ‘scientific’ or ‘popular’ responses, turned to Gothic and the uncanny as seemingly the most appropriate way to express both their excitement and their disquiet.

Notes

¹ S. Bottomore, ‘The Panicking Audience?: Early Cinema and the “Train Effect”’, *Historical Journal of Film, Radio and Television*, 19:2 (1999), 177-216 (p. 179).

² See ‘Hotel Scribe: Art and Image’, <http://www.hotel-scribe.com/en/the-art-gallery.html> (accessed 17 January 2014).

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- ³ L. Wilson, *Modernism and Magic: Experiments with Spiritualism, Theosophy and the Occult* (Edinburgh, Edinburgh University Press, 2012).
- ⁴ J. Teichmann, 'Wilhelm Conrad Röntgen', in A. Hessenbruch (ed.), *Reader's Guide to the History of Science* (London, Fitzroy Dearborn, 2000), pp. 658-60 (p. 659).
- ⁵ R. Purrington, *Physics in the Nineteenth Century* (New Brunswick, NJ., Rutgers University Press, 1997), pp. 148-9.
- ⁶ O. Glasser, *Wilhelm Conrad Röntgen and the Early History of the Roentgen Rays* (London, John Bale, 1933), p. 1.
- ⁷ In 1912, experiments by Max Theodor Felix von Laue concluded that X-rays are electromagnetic waves of a very short wavelength.
- ⁸ Quoted in W. R. Nitske, *The Life of Wilhelm Conrad Röntgen: Discoverer of the X-Ray* (Tucson, AR., University of Arizona Press, 1971), p. 95.
- ⁹ M. Willis, *Mesmerists, Monsters, and Machines: Science Fiction and the Cultures of Science in the Nineteenth Century* (Kent, OH., Ohio University Press, 2006), Chapter 7.
- ¹⁰ G. Byron, 'Gothic in the 1890s', in D. Punter (ed.), *A Companion to Gothic* (Oxford, Blackwell, 2001), pp. 132-42 (p. 134).
- ¹¹ Quoted in Nitske, *Life*, p. 91.
- ¹² *Ibid.*, p. 5.
- ¹³ W. Röntgen, 'On a New Kind of Rays', trans. A. Stanton, *Nature*, 53 (23 January 1896), 274-6 (p. 274).
- ¹⁴ K. Hurley, 'British Gothic Fiction, 1885-1930', in J. E. Hogle (ed.) *The Cambridge Companion to Gothic Fiction* (Cambridge, Cambridge University Press, 2002), pp. 189-207 (p. 194).
- ¹⁵ A. Smith, 'Hauntings', in C. Spooner and E. McEvoy (eds.), *The Routledge Companion to Gothic* (Abingdon, Routledge, 2007), pp. 147-54 (pp. 147-48).

¹⁶ This image can be viewed online at ‘Wellcome Images’,
<http://www.wellcomeimages.org/indexplus/image/V0029523.html> (accessed 30 April 2014).

¹⁷ S. Connor, ‘Pregnable of Eye: X-Rays, Vision and Magic’, 1-31, (p. 1),
<http://www.stevenconnor.com/xray/xray.pdf> (accessed 2 February 2014).

¹⁸ Quoted in C. Tuniz, *Radioactivity: A Short Introduction* (Oxford: Oxford University Press, 2012), p. 3.

¹⁹ Copies of the image of Anna Bertha’s hand were included with the preliminary report that Röntgen sent to his scientific peers. The image was subsequently reprinted alongside the first article about the discovery on the front page of *Die Presse* on 5 January 1896. As Lisa Cartwright has noted, ‘[t]his photograph, regarded as the earliest X-ray photograph of the human body, was widely published and bore an enormous symbolic weight in public culture’ (*Screening the Body: Tracing Medicine’s Visual Culture*, Minneapolis, MN., University of Minnesota Press, 1995, p. 115).

²⁰ Nitske, *Life*, pp. 97-98.

²¹ A. M. K. Thomas and A. K. Banerjee, *The History of Radiology* (Oxford, Oxford University Press, 2013), p. 5.

²² See Glasser, *Röntgen*, pp. 422-79.

²³ S. Reiser, *Medicine and the Reign of Technology* (Cambridge, Cambridge University Press, 1978), pp. 58, 62.

²⁴ Quoted in E. Posner, ‘Reception of Röntgen’s Discovery in Britain and U.S.A.’, *British Medical Journal*, 4 (7 November 1970), 357-60 (p. 359).

²⁵ J. D. Edwards and R. Graulund, *Grotesque* (Abingdon, Routledge, 2013), p. 4.

²⁶ Glasser, *Röntgen*, p. 40.

²⁷ Reiser, *Medicine*, p. 60.

²⁸ For more on this, see Allen Grove's insightful analysis of the relationship between Röntgen's work, spirit photography and the ghost story in 'Röntgen's Ghosts: Photography, X-Rays, and the Victorian Imagination', *Literature and Medicine*, 16:2 (1997), 141-73.

²⁹ Quoted in T. Golan, 'The Emergence of the Silent Witness: The Legal and Medical Reception of X-Rays in the USA', *Social Studies of Science*, 34:4 (2004), 469-99 (p. 471).

³⁰ A commentator in the journal *Life* (February 1896), for example, argued that '[t]here will be no need to put a knife into a live animal when a ray can make its inner workings visible' (quoted in Nitske, p. 119).

³¹ See Haggard's *King Solomon's Mines* (1885) and *She* (1887), Conrad's *Heart of Darkness* (1899), and Booth's *In Darkest England and the Way Out* (1890).

³² Hurley, 'British Gothic Fiction', p. 192.

³³ G. Beer, "'Authentic Tidings of Invisible Things": Vision and the Invisible in the Later Nineteenth Century', in T. Brennan and M. Jay (eds.), *Vision in Context: Historical and Contemporary Perspectives on Sight* (London, Routledge, 1996), pp. 83-98 (p. 85).

³⁴ See M. Schneirov, *The Dream of a New Social Order: Popular Magazines in America, 1893-1914* (New York, Columbia University Press, 1994), pp. 76-124.

³⁵ H. J. W. Dam, 'The New Marvel in Photography', *McClure's Magazine*, 6:5 (April 1896), 403-15 (p. 405), <http://www.gutenberg.org/files/14663/14663-h/14663-h.htm> (accessed 10 January 2014).

³⁶ *Ibid.*, p. 412.

³⁷ *Ibid.*, p. 411.

³⁸ B. H. Kevles, *Naked to the Bone: Medical Imaging in the Twentieth Century* (New Brunswick, NJ., Rutgers University Press, 1997), p. 27.

³⁹ Dam, 'Marvel', p. 413.

⁴⁰ Connor, 'Pregnable', pp. 18-19.

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- ⁴¹ Schneirov, *Dream*, p. 77.
- ⁴² Dam, 'Marvel', p. 406.
- ⁴³ Cartwright, 'Screening', p. 115.
- ⁴⁴ Dam, 'Marvel', pp. 407, 405.
- ⁴⁵ B. Lightman, "'The Voices of Nature": Popularizing Victorian Science', in B. Lightman (ed.), *Victorian Science in Context* (Chicago, University of Chicago Press, 1997), pp. 187-211 (p. 188).
- ⁴⁶ *Ibid.*, p. 189.
- ⁴⁷ This image is reproduced in R. F. Mould, *A Century of X-Rays and Radioactivity in Medicine* (London, Institute of Physics Publishing, 1993), p. 9, and Glasser, *Röntgen*, p. 42.
- ⁴⁸ Reproduced in 'X-Rays in Medicine: The First Century', <http://www.bshr.org.uk/XraysinMed.html> (accessed 20 February 2014).
- ⁴⁹ See P. Hardy, *The Encyclopedia of Science Fiction Movies* (London, Octopus, 1986), pp. 19-20.
- ⁵⁰ A. Horner and S. Zlosnik, 'Comic Gothic', in D. Punter (ed.), *A Companion to Gothic* (Oxford, Blackwell, 2001), pp. 242-54 (p. 243).
- ⁵¹ C. H. T. Crosthwaite, 'Röntgen's Curse', *Longman's Magazine*, 28 (September 1896), 469-84 (p. 469).
- ⁵² *Ibid.*, p. 470.
- ⁵³ *Ibid.*, p. 470.
- ⁵⁴ *Ibid.*, p. 473.
- ⁵⁵ R. Swiderski, *X-Ray Vision: A Way of Looking* (Boca Raton, FL., Universal Publishers, 2012), p. 30.
- ⁵⁶ Crosthwaite, 'Röntgen's Curse', pp. 477, 478.
- ⁵⁷ *Ibid.*, p. 482.

⁵⁸ Swiderski, *X-Ray Vision*, p. 30.

⁵⁹ Dam, 'Marvel', p. 405.

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