

Day Two (Wednesday 14 July)

Session 5 09:00-11:00 BST

5A – Contextualising Early Modern Natural Philosophy | Chair: Jennifer M Rampling

“Somewhat Mongrell:’ William Petty, Double-Bodied Shipping, and the Dimensions of Experiment”

Paddy Holt (University of Sydney)

When William Petty constructed at least four vessels between 1660 and 1685, the wily son of a cloth-maker and founding fellow of the Royal Society of London was aiming to demonstrate the merits of what he called “double-body’d shipping.” This was more than an attempt to wean naval architecture off an addiction to ballast, distributing the previously discrete form of the ship across two conjoined hulls or “bodies.” It represented a dramatic widening of the reach of experiment. This article will explain how the success of Petty’s craft came to depend on activities and schemes performed across a network of spaces vaster even than the decks of his increasingly large vessels – one crucial for needs such as financing and the hiring of experimental hands. Experiments on this scale became easy targets for scepticism and satire, their extraordinary visibility, and their obvious vulnerability to bodily separation, exposing them to a burgeoning number of critics. In seeking to stretch experiments to utilitarian dimensions, Petty became the architect of trials that were too cumbersome to control. His increasingly large vessels became one of the smallest parts of the whole enterprise, which in its final years had swollen to ungovernable proportions. These were new experiments – in the dimensions of experiment itself.

Christiaan Huygens’ Euclidean Track Shute

Gerhard Wiesenfeldt (University of Melbourne)

Using the example of Christiaan Huygens’ posthumously published *De motu corporum ex percussione*, this paper will explore the relationship between the experience of physical space and the abstraction of geometrical space. Huygens’ work is widely regarded as central for the emergence of the concept of classical relativity of motion based on the principle of indistinguishability of points in an abstract Euclidean space. His study was firmly grounded in a Dutch tradition of practical geometry, which was frequently acknowledged by him. While this tradition has often been studied with respect to the peculiar social structure of the Dutch Republic, this paper will look at a different context - the peculiar Dutch landscape. The landscape was not only unusually flat to allow for a straightforward application of plane geometry, it also was understood as being the product of centuries of human labour that had converted a mixture of swamp and water into this geometrical plane.

The paper will take up an argument presented in Wolfgang Schivelbusch’s classic study *The Railway Journey*, in which he argued that railway transport introduced a new understanding of physical space and time based on Newtonian physics and Euclidean geometry. Already in the 17th century, a form of public transportation comparable to the railroad was

established in the Dutch Republic - the system of track shutes (canal boats) that carried hundreds of thousands passengers each year between all major cities in straight lines. In this mode travel time could be equated with distance between the points of departure and destination. Huygens was three years old when the first track shute canal opened in 1632, he thus belonged to the first generation that grew up with this transport mode as normality, while it was unprecedented for foreign visitors, who often described the system as a miracle.

In *De motu corporum ex percussione*, Huygens based his reasoning on the famous thought experiment of one man standing on a boat and another on a riverbank, both watching a collision of balls they were holding. From his manuscripts it becomes clear that Huygens was thinking about track shutes when he developed his thought experiment. While this might be considered to be a nice anecdote about the origin of a thought experiment, I will argue that the connection between transport system and thought experiment is more significant, as it was embedded within the early modern Dutch cultural memory. After all, the track shute system was just another manifestation of the centuries old waterworks system of canals and drainage pumps that had created the Dutch landscape in the first place. Huygens' abstraction in Euclidean space was based in a long tradition of thinking about physical space.

Knowledges of Geography and Geographies of Knowledge: Martino Martini's *Novus Atlas Sinensis* and the Emergence of Mathematical Cosmography

Gianmar Giovannetti-Singh (University of Cambridge)

In 1655, as Martino Martini was defending the Jesuits' proselytising strategies to the Congregation for the Propagation of the Faith in Rome, his atlas of East Asia, the *Novus Atlas Sinensis*, was published in Amsterdam by the renowned Dutch printer and official cartographer of the VOC, Joan Blaeu. This atlas, which constituted the eleventh volume of the Blaeu family's exceptionally influential *Atlas Maior*, appeared strikingly different from many contemporary maps of the non-European world—particularly those of the Americas. Martini's maps show a standardised iconography of topographical and administrative features such as mountains, rivers, deserts, coastlines, lakes, and cities; they exhibit geometrical details including scale-bars calibrating "Chinese stades" against "German miles," and contain cartouches that for the most part depict the peoples of different Chinese provinces as not enormously dissimilar from Europeans. While historians have rightly emphasised that the *Novus Atlas Sinensis* played an important role in displacing and transforming Europeans' conceptions of East Asia, this paper suggests that, through Blaeu's efforts to encourage his burgher readership to compare different parts of the world, it effected more profound changes on European conceptions of the credibility of different forms of witnessing and projecting the "Other." The paper traces a genealogy of mathematical cosmography to Martini's atlas, suggesting significant continuities between the missionary's maps and those that came to be associated with the Enlightenment's "modern" cartographic representations of Other territories.

The Roman Inquisition and Talismans: The Rejection of Albert the Great's Astrology

Neil Tarrant (University of York)

As Simon Ditchfield has argued, many supposedly 'Tridentine' features of early modern Catholicism were not discussed at the Council of Trent. In this paper I develop this point, noting that the history of censorship of science and magic in the post-Tridentine era has frequently been understood as the application of standards established at the Council of Trent. The only time that these matters were discussed at the council, however, was during the drafting of the 1564 Index. Using the case study of astrological talismans, I argue that after the Council of Trent the Roman Inquisition implemented a censorial regime informed by a programme of reform unrelated to that established at the council, which set the parameters for intellectual discussion of the natural order.

Christians contested the orthodoxy of astrological talismans between the thirteenth and sixteenth centuries. The debate hinged on whether talismans could produce their effects naturally. Although Thomas Aquinas had explicitly rejected the use of talismans, Albertus Magnus had considered them to be perfectly legitimate. By the mid-sixteenth century the orthodoxy of talismans remained disputed, although this issue was not explicitly discussed at Trent. From the later fifteenth century, Dominican inquisitors were increasingly hostile to the art of producing astrological talismans. The establishment of the Roman Inquisition allowed them to establish their definition of the boundaries of orthodoxy as the only one acceptable within post-Tridentine Catholicism, a feat they achieved through the censorship of works of authors such as Albertus Magnus, Arnald of Villanova and Pietro d'Abano.

5B – Geographies | Chair: Rebekah Higgitt

Astronomers of the human constellations: triangulating science via transdisciplinary metaphorical instruments

Emily Hayes (Oxford Brookes University)

Drawing on histories of geography, anthropology and science, this paper assesses a number of personal, practical and intellectual points of intersection between geography, anthropology and astronomy in the late nineteenth century and early twentieth century. It argues that later nineteenth-century practitioners of geography such as Francis Galton and Halford Mackinder cultivated a subject whose scope encompassed not only topographical, but also human phenomena. In seeking to project the scientific authority of a still little-defined discipline of geography, such figures tethered their branch of knowledge to that of astronomy and by adapting conceptual terms and methods, notably by rescaling observational practices and instruments, borrowed from that discipline. These practitioners did so as disciplinary boundaries and spaces shifted, and the popular and institutional morphing discourse of geography became more firmly established in British academic institutions. Yet for all of the emphasis placed on metrological methods, geography remained a strongly literary and philosophical subject that was reliant upon the powers of the imagination. During a period of institutional proximity between geography and ethnology and strong connections between individual practitioners of geographers, anthropologists and ethnologists, the metaphorical capital of geography, which also

relocated language borrowed from terrestrial survey practices, was transferred into what would broadly become known as social anthropology, including the structural anthropology of Claude Lévi-Strauss in the twentieth century.

Linguistic surveys and the 'unscientific' map in late colonial India

Philip Jagessar (University of Nottingham)

In 1896 a monumental project to survey, classify and map the languages of the Indian subcontinent began under the authority of a linguist and administrator, George Grierson. By the time the final volume of results was published in 1928, the Linguistic Survey of India (LSI), as it came to be known, had surveyed over 179 languages and 544 dialects. A key ambition of the LSI was to locate and map language, resulting in forty-five maps published of different language groups, languages and dialects across India. However, mapping language was a complex and, at times, haphazard process and the LSI depended on the 'scientific' expertise of the Survey of India to help compile and publish maps.

However, the LSI had great difficulty reconciling the 'scientific' expectations of mapping, which the Survey of India came to embody, and the reality that the geography of language was vague, indefinite and difficult to map. This paper argues that the Linguistic Survey produced maps which were implicitly approximate, imperfect and 'unscientific', challenging the colonial government's assumptions about what maps could – and could not – visualise and delineate. However, once published, the LSI could no longer control the map as a source of knowledge and consequently came to be read and used as an objective and empirical representation of a language's geography, in the same manner a topographic map was regarded as an accurate reflection of geography.

Ida Pfeiffer the first female solo traveller and collector

John van Wyhe (National University of Singapore)

Ida Pfeiffer (1797-1858) was an Austrian widow of meagre means who, at the age of 44 in the 1840s, took the unprecedented step to travel the world alone. Despite the disapproval of society at that time, Pfeiffer pushed her way through countless obstacles and objections. She travelled to the Holy Land, Egypt, Iceland, Scandinavia, South America, China, Southeast Asia, India, South Africa and the USA. Along the way she survived storms at sea, parched deserts, malaria, near drowning, earthquakes, robbers, head hunters and cannibals. After each of her five voyages she wrote a best-selling book. She soon became world famous. In addition to being the first female tourist, she was also a collector of natural history specimens which she sold to museums and collectors. She made extraordinarily diverse collections including plants, seaweed, marine invertebrates, insects, spiders, mammals, birds and fish as well as ethnographic artefacts. She discovered hundreds of new species and thus gained a very different sort of fame. Some of her specimens were sold through the London agent Samuel Stevens, who was also agent for Alfred Russel Wallace. They never met but Wallace read her works and re-traced all of her extensive travels in the Malay archipelago. Her observations were cited by Darwin and a host of other men of science. If

remembered at all today it is as a traveller. But her influence on natural history was just as great yet it has been quite forgotten.

Children's Programme: Rainbow Fun | Host: Erin Beeston

The aim is to provide a fun, interactive session for conference attendees with children. This year's theme is the rainbow, inspired by the history of the science of light, we will conduct experiments together and explore where we see rainbows.

Session 6 11:30-13:00 BST

6A – Re-evaluating Legacies | Chair: Lea Beiermann

Georg Zuelzer and the Discovery of Insulin – a Greek Tragedy?

Kersten Hall (University of Leeds)

Had German clinician Georg Zuelzer lived long enough to see the centenary of the discovery of insulin this year, it is highly doubtful whether he would have been joining in with the celebrations.

For when Zuelzer first heard that Canadian scientist Fred Banting had been awarded the 1923 Nobel Prize in Physiology or Medicine for the discovery of insulin in extracts of pancreatic tissue two years earlier, he was utterly dismayed. In protest, Zuelzer wrote to the Nobel Committee, arguing that, having isolated pancreatic extracts in 1908 and shown them to be effective in patients, he should be recognised as the rightful discoverer of insulin.

But Zuelzer's protests were in vain and today he has largely been forgotten. When once asked about the contribution of Zuelzer, Charles Best who had shared with Banting in the discovery of insulin dismissed him as simply having failed to 'convince the world' of what he had found.

But is this really a fair treatment of Zuelzer? And did his claim to be the true discoverer of insulin have any foundation? Using my knowledge of the German language, I have studied the handful of surviving novel archival sources that relate to Zuelzer. In this paper, which forms a chapter in my forthcoming book 'Insulin: The Crooked Timber' to be published by Oxford University Press later this year to mark the centenary of this medical milestone, I use these sources to reassess the contribution of this scientist whose life has since been compared with the stuff of Greek tragedy.

From Charcot to Freud: a non-existent bridge

Eder Schmidt (Federal University of Juiz de Fora)

In the historiography of mental disorders, Charcot and hysteria are invariably linked to each other. The less careful approaches to the Salpêtrière Master's work often assume that his understanding of hysteria started from his early substantive misconceptions, progressing to a later anticipation of Freud's early proposals for the hysterical condition.

What we propound in this article is that the reading of his conceptions of the disease, considering only his texts as sources, would not warrant this assertion: the Charcotian notion of the ailment remained fully integrated in the field of the nervous system. Therefore, it is not possible to identify in Charcot's own text the alleged bridge linking him to Freud.

Indeed, Charcot began to resort to the realms of psychology; but did this mean a break with neurology and a move towards what has become psychoanalytical theory? The answer is

no, if we look at what psychology Charcot resorted to. In fact, he was in agreement with physiological psychologists such as Theodule Ribot and Charles Richet. His references to an unconsciousness, as opposed to a consciousness, was nothing like anything that Freud himself could accept as analogous to the notion of the Unconscious that he came to formulate.

In a faithful approach to Charcot's text, what can be read - and inferred only from what is read - is that the phenomena considered as hysterical are invariably referred to neuroanatomy and neurophysiology, and we find no elements that support a connection between the Charcotian work and the Freudian work.

The Dogmatic and the Pragmatic Physicist – Johannes Stark's Epistemic Virtue and Vice Rhetoric

Alexander Stoeger (Leiden University)

At the beginning of the 20th century, Einstein's theory of relativity and the discovery of Quantum mechanics changed physics and the image of the physicist significantly. Not everyone was content with this paradigm shift, however. One of the fiercest opponents of the rise of theoretical physics was the German Nobel laureate and experimental physicist Johannes Stark (1874-1957). Stark regarded the epistemic arrogance and dogmatism theoretical physicists allegedly showed as a threat to experimentally based physics. He co-founded the German Physics movement to defend his ideal of the empirically working physicist against the increasing popularity of theoretical physics. Less successful during the 1920s, Stark eventually gained influence with the rise of the National Socialists. He integrated their anti-Semitic language into his rhetoric of the epistemically vicious theoretical physicist to justify the exclusion of his opponents not based on their work but on their alleged epistemic character traits.

In this paper, I will discuss how Stark, as a representative of the outdated paradigm, used the language of epistemic virtues and vices in his political publications between 1922 and 1945 to convince the scientific community of the threat theoretical physicists were to 'true' physics. By comparing earlier and later texts, I will show the connection between his developing anti-Semitic rhetoric and the consistency in his use of accusations of epistemic vices to point to the potential danger of discrimination and exclusion through epistemic virtue and vice rhetoric.

6B – Spooky Science | Chair: Chitra Ramalingam

The ambiguous status of vision in the nineteenth century sciences had obvious significance for phenomena that seemed to exist on the boundary of seeing and other sensory experiences: spectres. The sciences of spectres were never more vibrant than in this period and helped shape a host of established and emergent scientific disciplines. Natural philosophical, physiological and medical studies of illusions, hallucinations and related mental aberrations added much weight to Enlightenment arguments against the reality of ghosts, apparitions and related phenomena. However, many questioned the capacity of

physical and physiological theories arising from such studies to explain all ghostly experiences. Many such experiences were hard to reduce to hallucination, fraudulence and other commonly-held explanations and it was a new scientific approach to such cases that inspired the foundation, in 1882, of that most 'spooky' of all Victorian scientific organisations: the Society for Psychical Research. The foundation and appeal of this organisation testifies to widespread interest in sensory phenomena that could not be easily subjected to the regimes of mechanical objectivity and seemed to indicate capacities to transcend recognized sensory channels. In this session we explore aspects of the sciences of spectres with a view to elucidating the ways in which ghosts and their production both challenged and reinforced Victorian notions of objectivity.

Chair/Commentator:
Chitra Ramalingam (Yale University)

Panel:

'Raising ghosts, raising devils, and raising the wind': phantasmagoria and the technologies of Victorian illusion

Iwan Rhys Morus (Aberystwyth University)

When Paul de Philipsthal opened his phantasmagoria at the Lyceum Theatre on 5 October 1801, he was inaugurating an important new tradition of illusive performances. The show was "at once striking and philosophic," and "promises great profit to himself, as well as scientific and useful amusement to the Public." It is striking that one of the most detailed accounts we have of a phantasmagoric performance was by William Nicholson in the pages of the *Journal of Natural Philosophy*— and telling that Nicholson also describes his efforts to reproduce the illusions he had seen. In Philipsthal's wake, natural philosophers from David Brewster to John Henry Pepper offered their own technologies of spectral illusion, designed not just to entertain through illusion but to interrogate the place of spectacle in philosophical culture. In this paper I investigate these technologies to see what they can tell us about the lessons ghosts taught their audiences about the stability of visual knowledge.

Sound reason: rationalizing the soundscape of colonial Bengal, 1867-1914

Projit Mukharji (University of Pennsylvania)

There is now a rich historiography that locates the authority of scientific rationality within a new visual culture that emerged from the late seventeenth century onwards. New technologies of witnessing, spectacular demonstrations and novel modes of visual representation helped establish the authority 'science'. Indeed, some have even narrated the history of modernity itself as a triumph of vision and the denigration of the non-visual. The historiography of science's entanglements with the supernatural and the occult has also described the centrality of vision. This in turn has produced a general neglect of the scientific engagements with unexplained phenomenon known exclusively through non-visual senses. In this paper, I will explore a series of scientific explorations of a series of mysterious, loud sounds known as the 'Barisal Guns' throughout central Bangladesh. Local belief had attributed these sounds to the demon king Ravana opening the doors of hell. But

self-consciously modern scholars—both Bengali and British, mostly connected to the Asiatic Society of Bengal, sought to redefine the phenomenon in terms of geology, volcanology and electricity, through repeated investigations throughout the Victorian and Edwardian eras. By accessing this forgotten history of sonic research, I plan to add a soundtrack to the silent historiography of Reason under colonialism.

‘Spooky actions at a distance’: creative engagements between physics and spiritualism, 1880-1900

Richard Noakes (University of Exeter)

A common assumption in the historiography of physics is that the major theoretical developments in the discipline during the twentieth century coped far better than ‘classical’ physics had in accommodating mind, consciousness and even paranormal effects. Interpretations of quantum theory in the 1960s and ‘70s, for example, seemed to make telekinesis more plausible via the idea of ‘spooky’ action at a distance between ‘entangled’ electrons. This paper argues, however, that late nineteenth century physicists engaged with the possibility of action at a distance and its psychic implications far more seriously than historians have claimed. I show that differences between field, ether and action at a distance theories were often unclear and heavily contested. This serves to contextualise my argument that even ardent champions of the ether theories (e.g. G. F. FitzGerald, Oliver Lodge, Balfour Stewart) accepted the existence of domains where direct action at a distance might apply or, as in the case of J. K. F. Zöllner, where arguments against its physical plausibility broke down. Moreover, it was the evidence of puzzling psycho-physical effects arising from spiritualism and psychical research, that nurtured this flexibility regarding theories of physical interaction.

Session 7 14:00-15:30 BST

7A – Biological Paradigms | Chair: Amanda Rees

‘Clairvoyant Palaeontology in Britain and the United States, 1840s–1910s’

Richard Fallon (University of Birmingham)

‘There are mental fossils for psychologists as well as mineral fossils for the geologists’. Such was the opinion of Kentucky physician Joseph Rodes Buchanan, who in the 1840s promoted the new science of ‘psychometry’. By this power a sensitive individual might read invisible impressions left on an object and thus gain incredible clairvoyant insights into its past state. Soon claims were being made that psychometry allowed one, merely by holding an object like a fossil, to actually see through time, all the way back to the birth of the planet. Subsequently, clairvoyants from the Indian-influenced Theosophical Society were able to view prehistoric scenes without even holding a fossil.

Psychometry and Theosophical clairvoyance have previously received attention from scholars of occult science but, as this paper demonstrates, their connections with palaeontology merit further attention. I argue that both the methodology and literary form used for psychometric experiments were indebted to contemporary work on earth’s deep history. Freethinking psychometric researchers William and Elizabeth Denton, for instance, cited geologist Edward Hitchcock’s speculations about photographic traces left in nature; meanwhile, literary accounts of clairvoyant visions adopted techniques of narrative and perspective previously developed in geohistorical literature. These techniques included so-called geological retrospects, orientalist visionary narrators, and the illustrated ‘scene from deep time’. This paper thus explores a substantial and until now largely overlooked intimacy between palaeontological and paranormal research.

“Science is Justified by Works, not by Faith”: American Biologists reject Ernst Haeckel’s Evolutionary Religion, 1874-1924

Daniel Halverson (University of Toronto)

Nearly half of Americans reject evolution. The perception that this foundational concept of biological science is atheistic and thus incompatible with theistic religion is an important contributing factor to this rejection. According to historian of biology Robert Richards, this association began with the polemically-charged popular science writing of the zoologist and militant atheist Ernst Haeckel, the world’s leading popularizer of Darwinism c. 1875-1920. I examine the works of eight American biologists who wrote about evolution and religion during Haeckel’s lifetime, and shortly after. I find that they routinely rejected Haeckel and his evolutionary religion. In some cases they disputed his inferences about religion, in others his assessment of the facts, but their most common complaint was that he had dogmatized and speculated, where science must confine itself to objective knowledge. As the zoologist William Keith Brooks wrote for *Science*, “Science is justified by works, not by faith, and when Haeckel says ‘Credo’ and not ‘Scio’ we need not discuss the value of his belief.” In the United States, Haeckel’s true allies in his effort to association Darwinism with atheism were

not biologists, but Protestant fundamentalists, who regularly pointed to his evolutionary religion as the manifestation of everything they feared Darwinism portended for the future.

“But we are not told what we are to regard as a jump”: Revisiting Darwinian, neo-Darwinian and Mutationist Views of Variation

Max Meulendijks

Julian Huxley’s *eclipse of Darwinism* narrative limited who could be thought of as Darwinian. Peter Bowler used that same eclipse to draw attention to previously understudied alternatives to Darwinism, but maintained the same flaw. This paper explores how late nineteenth-century neo-Darwinian accounts of Darwinism, including their critiques of mutationism, were later utilized by advocates and detractors of the *Modern Synthesis*. Recent work by John Beatty has shown how this continuity in neo-Darwinism hinges at least partly on a shared emphasis regarding importance of the *creativity* of natural selection. By drawing attention to Darwin’s conflicting accounts of variation, the paper emphasises how both mutationists and neo-Darwinians continued his investigations, but replaced Darwin’s ambivalence about variation with an exclusive focus on either *qualitative* or *quantitative* characters. Even after Fleeming Jenkin pointed out this ambivalence, Darwin was unwilling to commit to just one interpretation. The mutationist focus on *qualitative* characters had been popular among the earlier comparative anatomists as well. This suggests that other forms of Darwinism persisted in the late nineteenth- and early twentieth-centuries, because of a tension that existed between the *contingency* and *creativity* of selection in Darwin’s own work. This tension is traced out from Darwin’s conceptions of selection and variation into the work of Alfred Russel Wallace, Hugo De Vries, and Thomas Henry Huxley. In conclusion, it is argued that the eclipse narrative limits our understanding of Darwinian debates by privileging the emphasis on *creative* selection as the correct interpretation.

7B – Transnational Histories of Women in S.T.E.M | Chair: Patricia Fara

Chair and Commentator: Patricia Fara (University of Cambridge)

Organizers: Emily Rees and Graeme Gooday (University of Leeds)

National vs transnational histories of women in engineering and applied science

Graeme Gooday; Emily Rees; Ruth Sandwell (University of Leeds)

Like so much else in the history of science, narratives of women’s past work in engineering and applied science have traditionally been told in single-nation stories. There are obvious reasons for this: publishers see a big market for such accounts, academic promotions committees often favour them, and they are easiest for scholars to research and write up. But there are good reasons to resist this syndrome, not least because single-nation technoscientific tales too often respond to evidence of non-indigenous activity by downplaying, ignoring, or appropriating it. Our 2019 work on the centenary of the Women’s Engineering Society (WES) soon found that it was not as UK-focused an organisation as its historians have previously imagined. First, the 1935 WES directory reveals membership from across the (English-speaking) world as well as Germany. In the same decade, female engineering students from as far as China attended WES annual conferences, and at least

one refugee engineer from Nazi repression (Ira Rischowski) settled in Britain during World War 2 and wrote for WES's journal: the Woman Engineer. After the war that journal was increasingly world-facing, publishing commentary from overseas visitors to the International Conference of Women in Engineering and Science conference in Cambridge 1967, as well as reports of WES members working in India and Africa. Building upon those insights, this paper outlines a more inclusive transnational collaborative approach to the history of women in engineering and applied science, examined through the themes of international organisations, education, diasporas, conferences, and journalism.

Transnational histories of women in engineering and science: the International Conference of Women of Engineers and Scientists (ICWES) as a case study

Emily Rees (University of Leeds)

How do we locate transnational histories of women in engineering and science? One starting point is ICWES, a conference for women in engineering and science, that first met in 1964 in New York, USA and then in Cambridge, UK in 1967. Since then, meetings have been held in different continents every 3-4 years, with attendees from multiple countries, constituting a crucial meeting point for women in engineering and science. Yet, there has been little academic attention paid to the organisation and its history. What can we learn from ICWES about transnational meetings between women in the second half of the twentieth century? How did these women come together to try to solve global issues through scientific and engineering practices? This paper will open up discussions on how we can use a conference like ICWES to take a transnational approach to the history of science and engineering, as well as discussing the challenges of tracing the relevant archival material from disparate sets of sources.

Narrating transnational histories of women in STEM: A practical example

Sarah Qidwai (University of Toronto)

Growing up, I always took for granted that my grandmother could help me with my chemistry homework. For over thirty years, she taught the subject as a professor at APWA College, named after the All-Pakistani Women's Association. She earned her MSc in Chemistry in 1963, just sixteen years after the partition of India and the creation of Pakistan. Given that historians of science have demonstrated that the communication of knowledge, including education, is as central as the processes behind making scientific knowledge, it is important to broaden our own archives and sources. Building on both my own research and lived experiences, in this paper I will discuss how we can build a transnational approach to the history of women in science education. An approach, through oral histories, that ties in micro-transnational histories of women in STEM with intersecting contexts such as empire.

7C – Early Modern Natural History | Chair: Emma Spary**The Lesser Herbals and the Operation of Plant Signatures in Late Seventeenth-Century England**

Xinyi Wen (University of Cambridge)

Traditional historiographies often end the C17 English botanical history with the encyclopaedic 1640 *Theatrum botanicum* of John Parkinson, followed by the emergence of pre-Linnaean botany marked by John Ray. This paper will unravel a forgotten history of late C17 “lesser herbals” in England and their significance for history of botany and medicine. A term borrowed from Hannah Woolley, the “lesser herbals” referred to a popular late C17 genre of smaller-than-quarto herbals inspired by Nicholas Culpeper’s *English Physitian*. Small, compact and cheap, these herbals combined the characteristics of herbal literature and medical manuals, with a focus on English local plants and specific guidance for herbal preservation and remedy making. Influenced by the transmission of Paracelsian medicine to England, these herbals largely appropriated the doctrine of signatures — a Paracelsian theory arguing that plants’ morphological resemblance to human body parts indicated their curatorial value — as their leading methods of classification and remedy preparation, which made these books notorious as superstitions. In this paper, I examine the lesser herbals, their circulation and reading history, through a database of book sales catalogues, a close examination of annotated surviving copies and their commonplaces into manuscripts. I argue that the lesser herbals had a very wide readership from domestic practitioners to learned physicians, and significantly shaped the botanical tradition afterwards: embodying the theory of plant-body resemblance into actual processes of remedy making, the lesser herbals popularised the idea of plant signatures and made this belief persistent in the age of systematic botany.

Biodiversity and extinction in the 16th century: the case of Bernard Palissy

Jeremy Schneider (Princeton)

In this paper, I analyze the first recorded argument for species-extinction given by Bernard Palissy (1510-89) in a series of lectures published as *Discours admirables* (1580). I look at the different resources Palissy drew on in creating his vision of “lost species” (*especies perdues*). These include his experiences with overfishing and the depletion of rivers, his collecting of extinct fossil shells, and his reading (and misreading) of Latin works in vernacular translation. I show how he stitched all these elements together into an original argument in favor of extinct species. Particular emphasis will be laid on how Palissy’s experiences as an artisan influenced his thinking, in particular how the ever-expanding fisheries of his own day revealed to him the human causes of extinction and shrinking biodiversity in an age of global commerce.

The Human-Animal Boundary in Buffon's Natural History

Dario Galvão (Université Paris 1 Panthéon-Sorbonne, University of Sao Paulo, University College London)

In this paper I discuss the fluidity of the human-animal boundary in Buffon's Natural History. Despite recognizing that human beings are animals, Buffon rejects any suggestion that these two classes might be equated. According to him, on the contrary, there is a profound difference between them, which he states in core passages of his Natural History, notably the "Natural History of Man" (1749) and "Of the Nature of Animals" (1753). In these texts Buffon suggests that humans and animals are distinct in the same manner as spirit is distinct from matter, thus giving the impression of an absolute denial of rationality to animals, much as in the Cartesian conception of the animal-machine. Nevertheless, as my exploration reveals, his considerations about animal intelligence help us better understand his distinction, which should be approached less from a metaphysical or theological point of view as from a naturalistic one. From this perspective, the profound difference between humans and animals lies in the violence historically perpetrated by humans upon animals.

Keywords: rationality, animal intelligence, automatism, natural history, domestication.

Session 8 16:00-18:00 BST

8A – Race, Health and the Environment in the Long Nineteenth Century | Chair: Pratik Chakrabarti

Session Organizer:

Matthew Daniel Eddy (Durham University)

Session Chair:

Pratik Chakrabarti (University of Manchester)

“That Pliability of Functions by Which Man is Rendered a Cosmopolite”: Race, Diseases, and Statistics in the Nineteenth Century

Suman Seth (Cornell University)

One of the central questions taken up in the final section of Dr. Samuel Forry’s *The Climate of the United States and its Endemic Influences* (1842) concerned acquired immunities to local diseases. While humans were in principle able to live in any part of the globe, mobility came with a price. And it was also true that not all humans assimilated to new climates as easily as others. “The constitution of the negro,” Forry claimed, “is little fated to adapt itself to foreign climates,” while the “inhabitants of middle latitudes...manifest, in the highest degree, that pliability of functions by which man is rendered a cosmopolite.” It is the roots and fruits of the claim that climatic ‘pliability’ was a racial trait with which this paper is concerned. I trace its origins to a series of Statistical Reports on the health of the British Army, principally authored by Major Alexander Tulloch and published between 1838 and 1842. It would be picked up, via Forry, by the notorious American polygenist, Josiah Nott in 1856 and 1857, and thence be popularized, returning in a slightly changed form to Britain, where the equally notorious anthropologist James Hunt delivered a talk on the ‘Negros’ lack of pliability in 1863, as Tulloch sat in the audience. By the middle of the American Civil War, African anti-cosmopolitanism had become an innate, racialized characteristic.

The Conceptual and Scientific Foundations of “Race Correction”

Lundy Braun (Brown University)

In October 2019, Obemeyer and colleagues published an article in *Science* detailing how an algorithm produced by Optum directed medical treatment in about 40% healthcare systems in the US. According to the authors, the algorithm was not explicitly racist but in directing care to those that used the healthcare systems most often, which was white people, Black people were disadvantaged in the distribution of health care. This article unleashed concern about the racialized assumptions built into algorithms that ultimately reached the halls of Congress. And yet, few knew that the foundations for race-based algorithms were laid centuries prior when Thomas Jefferson commented on differences in the “pulmonary apparatus” of enslaved peoples in his *Notes on the State of Virginia*. Not until the mid-19th century, however, did this notion of pulmonary difference gain an empirical foundation in

the hands of plantation physician Samuel Cartwright, who built his own spirometer to measure lung function and quantified difference as approximately 20%. For the rest of the 19th century, spirometers were widely used in medicine, life insurance, anthropology, physical education, and physiology research, thereby cementing the scientific foundations of racial difference. There were moments of contestation by Black intellectuals, notably Kelly Miller and W.E.B DuBois who wrote fierce critiques of this idea. This paper explores how and why the idea of deep difference became entrenched in medical systems in the 19th century, such that “race correction”, also known as “race adjustment” or “race norming” remains common practice in respiratory medicine worldwide.

Theories of Wind and Imperial Science in the Nineteenth-Century American Empire

Elaine Lafay (Rutgers University)

The directions, consistencies, and temperatures of winds were central to nineteenth-century understandings of health and place. Knowledge of these winds structured theories of climate, and an array of historical actors deployed this knowledge in a variety of political, commercial, and cultural arenas. Physicians, travelers, and residents in the U.S. South used this knowledge to exert control over contested landscapes and buttress settler colonial hierarchies. The violent north winds of Texas, for example, featured prominently in debates over Texas independence and statehood. The characteristics of these winds varied according to one’s stake in Texas’ worth to the United States empire. Meanwhile, the role of the winds as disease-causing agents were embedded in public health debates over what combination of winds, built environment, and bodily constitution could best serve the American imperial project. Exploring how people understood different winds broadens our gaze beyond state, regional, and national boundaries and forces an engagement with a world defined not by landmass, but by the currents of air cutting a path across it. In this context, health and embodiment are not merely environmental but thereby intrinsically political, with claims to imperial science, and are co-constitutive of racial hierarchies.

The Evidence of Equality: Environmental Health and Human Development in Antebellum America

Matthew Daniel Eddy (Durham University)

The early years of the American Republic witnessed a sustained increase in scientific studies written by white intellectuals actively seeking to create or collect evidence of racial difference. As the data grew, the abolitionist movement became increasingly alarmed with the ways in which it was increasingly used to give a scientific veneer to racism. The black community responded to this epistemic injustice in two ways. The first approach was to develop a new form of ethnology which reinterpreted the evidence of human origins contained in classical literature. The second approach was to advance a new framework of human development which foregrounded the evidence of vitality presented in the physiology of the African diaspora. Recent studies on these two approaches have explored their reciprocal relationship within African American literature, religion and politics. In this paper I wish to examine their role in shaping the theories and practices of environmental health advocated by Dr James McCune Smith, one of the leading voices in the black community from the 1830s to the 1860s. Based in New York City and the first African

American to hold a medical doctorate, he used evidence gathered from his extensive knowledge of biomedicine to propose an alternative theory of the relationship between climate and environmental health. I explore his thought with a view to gaining deeper insight into the value that he attributed to different kinds of ethnological and physiological evidence and, more broadly, I seek to develop a better understanding of how such evidence helped him reinterpret the impact of environmental change upon human health.

8B – Imperial Expeditions | Chair: Jim Secord

Imperial Science and ‘Failure’: The Euphrates Expedition and the Route to India that Never Was

Lachlan Fleetwood (University College Dublin)

In the early nineteenth century, Suez was not the only possibility for a much desired shortcut between Europe and India. Serious consideration was also given to a route via Mesopotamia and the Euphrates River. In 1835, the lavishly funded Euphrates Expedition set out to determine the suitability of the river for steam navigation, assess its political complications and trade potential, and complete maps and natural historical surveys. The Expedition began with an extraordinarily labourious overland march through Syria, as two dismantled steam ships were hauled across the desert, a process actively resisted by both Turkish and Egyptian authorities, as well as local workers. Things did not become much easier on reaching the river, and a series of calamities ensued, most significantly the complete loss of one of the steamers in a hurricane. The Expedition has been relatively little studied – usually relegated to a footnote in the history of the Suez Canal – but in this paper I am primarily interested in using it to consider various notions of ‘failure’ and breakdown in the history of science. In terms of everyday expeditionary practice, the Expedition might be seen as a series of cascading failures, from cross-cultural negotiation to technological limits, and it was in another sense an imperial ‘failure’ as ‘the route to India that never was.’ At the same time, this paper interrogates a tension in recent historiography around what it means to tell the story of imperial science, exploration and surveying as one of limits, confusion, vulnerability and dependency – or ultimately ‘failure’ – given the often pervasive legacies and consequences of these activities for the places and peoples surveyed.

From Chemistry to History to the Vikings: Eben Norton and Cornelia Horsford, the Scientific Method, and the Search for Leif Eriksen’s House

Brian Regal (Kean University)

By the 19th Century, an extensive body of literature existed purporting to prove that Norse explorers had arrived in the New World well before Christopher Columbus, and thus were the ‘true’ discoverers of America. One of the most ambitious of these authors was Harvard chemist turned amateur historian, Eben Norton Horsford who wrote a number of lavishly produced tomes on the subject in which he claimed he had used the Scientific Method to locate important archaeological sites associated with this theory. What is less well known is the work of his daughter Cornelia ‘Nellie’ Horsford. Her father’s assistant and closest ally, Cornelia can be seen as part of the realm of female nineteenth century American archaeologists. With no formal training Nellie Horsford, because of her Boston Brahmin

pedigree and her father's status as a scientist, gained entrée to the world of professional archaeology. Her attempt to prove the Viking Theory of American discovery came in large part from an oath she swore to her father on his deathbed that she would prove he was correct.

Wilkinson vs Horner and Hekekyan: an unexpected twist in the history of Egyptology

Robert Frost (University of Nottingham)

The history of archaeology, and of Egyptology, has traditionally been written as a linear narrative of progress, with narrow-minded amateurs – the antiquaries – giving way to professional archaeologists. In particular, Joseph Hekekyan's (1807-1875) excavations (co-directed by Leonard Horner) has been regarded as the turning-point, with the geological principle of stratigraphy being applied to excavation, apparently giving rise to methodical archaeology.

I propose to challenge this narrative, by showing that two antiquaries, Samuel Sharpe (1799-1881) and Sir Gardner Wilkinson (1797-1875), were sufficiently acquainted with the local situation in Egypt to not only understand these excavations, but to point out how the premise of the excavations was disastrously flawed. In particular, Horner – as well as Sir Charles Lyell – had mistakenly assumed that the principle of uniformitarianism was universally applicable, with the result that they imposed an incorrect reading onto the available evidence.

In particular, I will consider a previously misinterpreted correspondence between Wilkinson and the eminent geologist, Sir Charles Lyell. Following Sharpe's discrediting of the Horner-Hekekyan excavation programme, Lyell sought Wilkinson's expertise and attempted to get his stamp of authority to save a part of Horner's conclusions from the critics.

Lyell was ultimately to be frustrated in his attempt to gain Wilkinson's support, as Wilkinson sided with Sharpe, and pointed out further problems with the excavators' methodology. Lyell did however receive some consolation, as he was able to acquire material from Wilkinson for two book projects, again demonstrating Wilkinson's knowledge in an area which has not been previously appreciated.

8C – Medicine as Expertise and Practice | Chair: Erin Beeston

“A Second New Deal for the Blind”: Crippling Welfare Maintenance Infrastructures

Leah Samples (University of Pennsylvania)

Drawing on the history of technology, history of medicine and disability, and critical disability studies, this paper examines how the on-the-ground implementation of mid-twentieth century federal and state welfare administrative infrastructures, namely the Social Security Act, designed to provide income security for indigent disabled Americans, which relied on the maintenance practices and labor of the aid recipients themselves, ultimately altering the bureaucratic infrastructure in ways the federal and state bureaucrats never imagined. Using the case study of Title X: Grants to States for Aid to the Blind of the

Social Security Act, I look at the complex and frequent maintenance routines blind Americans were expected to perform, such as regularly visiting state-approved ophthalmologists to confirm their blindness, continuously tracking and recording any gifts received from friends and family members, and even maintaining weekly, state-approved budget for their entire household expenses. Failing to perform even one of these routines could cost them their welfare benefits. While these state-approved maintenance regimes were designed to standardize the process of efficiently and effectively administering and managing federal funds, we see that these monthly payments were unreliable in practice, contributing to an insecure existence for many blind citizens. Yet, disabled Americans used the knowledge they gained from these practices for political action to disrupt the existing welfare infrastructure. By crippling maintenance practices designed to standardize and force likeness, sightless Americans instead used these very maintenance practices, like the eye exam or the household budget, to bring attention to the dynamic nature of vision, the messiness of kin relations, and the inadequacy of their current aid allotments.

Experience as expertise: Clara Park's call for valuing a mother's knowledge

Marga Vicedo (University of Toronto)

First-hand experience has been considered crucial for obtaining knowledge in many realms. Yet, personal experience has also been suspect since the knower's subjectivity could bias what many sciences saw as necessary for objective knowledge: detachment from one's object or subject of study.

In the field of child development, the first hand experience of parents in childrearing has had little impact. In the early twentieth century, researchers welcomed the observations provided by mothers. However, as the field became professionalized, male researchers dismissed patience, sympathy, and other traits associated with maternal care as interfering with scientific investigation.

This paper examines how Clara Park challenged that stance in her writings about raising her autistic daughter Jessica. In her 1967 book *The Siege* and other writings Park called upon scientists to recognize that daily contact with their children allowed parents to acquire "deep knowledge of the child in context." She argued that experience was one type of expertise that could complement clinical and research work. Park fought to have a mother's voice recognized as a legitimate source of expertise.

In this paper, I situate Park's work within a larger historical and philosophical discussion about experience and expertise.

Origins and rise of Laboratorios Grifols: the industrialization of haemotherapy in Barcelona (1880-1955)

Christina Sans-Ponseti; Paloma Fernández-Pérez (IHC-UAB, UB)

The use of blood in industrial processes has a rich history. Over the last hundred years, it was propelled by war and the introduction of industrial capitalism in the medical sciences. In addition, in Barcelona the first haemotherapists were closely related with the evolution of private medical clinics. The history of *Laboratorios Grifols*, from 1880 to the 1950s, is a relevant case study in this context, as it highlights how the small-scale scientific practices became industrialized processes.

In our communication, we study how a small laboratory in the healthcare district of Barcelona built its scientific foundations on laboratory medicine during the early 20th century, and finally changed its business strategy because of the Spanish Civil War, becoming a family pharmaceutical company. The findings highlight the importance of interdisciplinary analysis, suggesting that both scientific and business adaptations by successive generations were equally important in explaining the success of Grifols in industrializing haemotherapy. We will show, firstly, how blood changed from a high-tech laboratory product to a medicine after the Spanish Civil War, and how the implementation of large-scale industrial methods turned it into a raw material, capable of feeding a global industry, with plasma becoming the key element.

Take cover! : Resilience and fragility at the wartime British Journal of Anaesthesia

E. Shaw (University of Manchester)

The long running debate about the impact of war on medicine, while well-rehearsed in academic circles, is often passed by in practitioner histories. Anaesthetic histories of the twentieth century point to World War Two (WWII) as the watershed moment for professional anaesthesia, seen as rising to the challenge of wartime practice and emerging from the war to take up a place as a consultant-led specialty in the NHS. The British Journal of Anaesthesia (BJA), at the time the primary anaesthesia journal in the UK, had from 1923 taken on the self-appointed role as specialisation-maker for anaesthesia, a prime defender and promoter of specialist anaesthetic practice. However, during WWII, the BJA was facing a significant set of challenges. Lack of printing paper, conscription of contributors and editors, and attempting to provide useful information for readers engaged in wartime anaesthesia threatened to overwhelm the journal. At the same time its role in providing a forum for discussion and a place to share research and findings from practice was never more crucial, with debates about anaesthesia education, the remuneration of anaesthetists, and the safety of old drugs ether and chloroform compared to new contenders such as barbiturates and local anaesthetics coming to a head in the newly pressurised context of wartime. This paper illuminates the complexities of the impact of war on the network of organisations, professional relationships and communities of knowledge which underpin specialities like anaesthesia. The pre-war strength of these components ensured that the specialism could survive the strain of wartime