




ARTICLE

‘One of the most alarming casualties to which the Sailor is exposed’: British Naval Medicine, Embodied Knowledge, and the Experience of Lightning at Sea, 1750–1840

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Abstract

Lightning-related accidents were relatively frequent among age-of-sail seafarers, due to tall ships’ exposure and prominence above the sea. Yet lightning remains largely neglected in the historiography on sailors’ experiences. Examining a range of contemporary medical and philosophical literature, shipboard surgeons’ journals, operational correspondence and seamen’s memoirs, this article argues that lightning strikes created unique moments of epistemological and social crisis aboard naval ships. With its awesome multi-sensorial manifestations, divine symbolism and catastrophic and erratic effects on human bodies, lightning loomed large in many seafarers’ consciousness, as a powerful source of panic and trauma. At the same time, despite contemporary developments in natural philosophical understandings of electricity, surgeons’ training on how to treat these injuries remained limited. As a result, lightning could substantially affect naval shipboard relations between officers and ‘common’ seamen, creating challenges to the former’s authority and mobilising a range of competing emotions and knowledges. Considering lightning illustrates the fruitfulness of looking at uncommon but devastating types of injury, for historians interested in medical authority and in the doctor–patient relationship. It also helps us to start sketching accounts of seafaring bodies, health and maritime medical and religious cultures that give the sky its due place alongside the water.

Keywords: lightning; navy; surgeons; storms; injury; Blue Humanities; seafaring; electricity; history of medicine

On 12 June 1814, the crew of the British naval ship *Palma* experienced a pitch-black evening of ‘most awful’ thunder and lightning, during which ‘the storm seemed to be confined to the part, in which the frigate was anchored’. ‘[L]ong before any injury was done’, the vessel’s surgeon wrote in his journal, the men were imagining a lightning strike with bated breath, as they ‘could distinctly see the electric matter fall all round

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the ship'. So when the hit finally came, in an atmosphere of accumulated tension, utter chaos burst out aboard. The surgeon 'ran on deck, but had much difficulty in silencing the people who kept crying out that the gully was full of dead and dying people'. When he reached it, he 'found a lamentable scene'. 'It is not possible to describe the confusion,' he wrote, 'and horror – every thing was out of its place – the gully filled with smock [sic], and a strong sulphurous smell'. Seven men were wounded, one dead, and 'many others cut & bruised'.¹ Their treatment would prove complex and uncertain.

Storms are a staple of how life at sea is usually imagined and reconstructed. However, most representations tend to focus not on the dangers of lightning, but on those of wind and water: sinking, drowning and shipwreck.² Cultural and environmental maritime studies have rallied around the banner of the 'blue humanities', looking to the depths rather than the skies.³ Historians of seafaring and maritime health, too, only tend to discuss lightning in passing.⁴ This article, instead, argues that lightning occupied a specific and powerful place in naval culture and society: at once awesome, terrifying, and devastating, and known to single out individuals in sudden and often unpredictable ways, it brought into play multiple strands of knowledge, uncertainty and belief. Medical history, in particular, is a key site for recovering the embodied, emotional and experiential dimensions of lightning strikes.

What are the chances of being hit by lightning? The answer has always been different for different social and occupational categories.⁵ According to some mid-nineteenth-century studies by inventor William Snow Harris, hundreds of ships belonging to the British Navy had been struck since the beginning of the French Wars in 1793.⁶ Between 1824 and 1840, he calculated, on average about one in four of the British naval 'vessels annually at sea' was hit by lightning.⁷ This only refers to incidents that were recorded in shipboard journals, and craft that survived – suggesting the likelihood of a substantial underestimate. Lightning strikes at sea also came with human costs: mostly in the seventeen years from 1799 to 1815, 'upwards of seventy seamen were killed, and one hundred and thirty-three wounded, exclusive of nineteen

¹'Medical and surgical journal of HMS *Palma* for 28 February 1814 to 15 March 1815 by Thomas Alexander, Surgeon', London, The National Archives (TNA), ADM 101/112/1, fos. 11v–12r.

²See e.g. Steve Mentz, '"We Split!": Shipwreck in Early Modern European History and Culture', in *The Routledge Companion to Marine and Maritime Worlds 1400–1800*, ed. Claire Jowitt, Craig Lambert and Steve Mentz (2020), 580–97.

³John R. Gillis, 'The Blue Humanities', *Humanities*, 34 (2013), 10–13.

⁴Coriann Convertito, 'The Health of British Seamen in the West Indies, 1770–1806' (Ph.D. thesis, University of Exeter, 2011), 90–1, 162–3, 168; Roy Adkins and Lesley Adkins, *The War for All the Oceans: From Nelson at the Nile to Napoleon at Waterloo* (2007), 69–70.

⁵Derek M. Elsom, 'Factors Contributing to a Long-Term Decrease in National Lightning Fatality Rates: Case Study of the United Kingdom with Wider Implications', *International Journal of Disaster Risk Reduction*, 31 (2018), 341–53. For a summary of modern studies, see Brian Mills *et al.*, 'Assessment of Lightning-Related Fatality and Injury Risk in Canada', *Natural Hazards*, 47 (2008), 157–83, at 167–8, 180. See also Wenjuan Zhang *et al.*, 'Lightning Casualties and Damages in China from 1997 to 2009', *Natural Hazards*, 57 (2011), 465–76, at 472–4.

⁶W. Snow Harris, *On the Nature of Thunderstorms; and on the Means of Protecting Buildings and Shipping against the Destructive Effects of Lightning* (1843), vi–vii.

⁷W. Snow Harris, *Remarkable Instances of the Protection of Certain Ships of Her Majesty's Navy, from the Destructive Effects of Lightning ...* (1847), 37.

cases in which the number of wounded ... [was] returned as “many” or “several.”⁸ If we round this to about 300 casualties, the total amounts to a mean of approximately eighteen instances of personal injury a year. In that same period, the number of men reported as serving in the Navy each year was on average about 121,200.⁹ This means that, in any given year, a naval sailor serving that full year would have roughly one chance in 6,700 of being struck and hurt by lightning.

Albeit with substantial geographical variation, modern estimates place the global annual risk of being hit by lightning at a relatively negligible one in four million chances; in most national-level studies, the rate remains on a similar order of magnitude.¹⁰ Naturally, we must account for our current use of lightning protection systems, and overall prevalence of indoor occupations. However, in the 1760s, the American natural philosopher Benjamin Franklin, who was leading the international campaign to install electrical rods on buildings, already admitted that ‘perhaps ... not one death (or the destruction of one house) in a hundred thousand’ was caused by lightning.¹¹ By the 1850s, a modern study of British death certificate summaries finds just over one lightning-related fatality per million people.¹² On the whole, it seems clear that age-of-sail seamen were uncommonly vulnerable to medical risks from atmospheric electrical discharges, by comparison with their shore-based contemporaries. This is easily explained when one considers the shape of masted tall ships, and their exposure and prominence over the featureless surface of the sea. Effective, fixed conductors only began to be installed aboard naval ships from the 1830s and 1840s, and were subsequently made superfluous by the shift to metal shipbuilding; before then, seamen lacked any real protection.¹³ Yet there is limited trace of this significant bodily hazard

⁸Harris, *On the Nature*, vii, ix.

⁹This figure comes from averaging yearly returns for those seventeen years (which would yield, more precisely, 121,192.4 men per return): N. A. M. Rodger, *The Command of the Ocean: A Naval History of Britain, 1649–1815* (2004), 639 (column ‘Borne (1)’). Because ‘borne’ simply meant listed on a vessel’s muster-book, but not necessarily present aboard, this is potentially an overestimate. Using yearly returns of personnel, here, is the main option available, but it is far from ideal. It only offers very imprecise data, and it does not capture turnover and duration of service for each individual: at best, we can treat it as a rough count of ‘service years’, the collective total of year-long units of time in the service that were put in each year by the Navy’s workforce. The figure of 300 or so casualties, as we saw, is also built on a vague (if probably underestimated) count. Therefore, the value of 1/6,700 suggested below is only to be read as an extremely crude, indicative estimate of the number of personal lightning accidents over person-years spent in the Navy.

¹⁰‘What Are the Chances of Being Struck by Lightning?’, *Britannica*, <https://www.britannica.com/question/What-are-the-chances-of-being-struck-by-lightning>; Mills *et al.*, ‘Assessment’; Zhang *et al.*, ‘Lightning Casualties’; D. M. Elsom, ‘Deaths and Injuries Caused by Lightning in the United Kingdom: Analyses of Two Databases’, *Atmospheric Research*, 56 (2001), 325–34; Brian Mills, ‘An Updated Assessment of Lightning-Related Fatality and Injury Risk in Canada: 2002–2017’, *Natural Hazards*, 102 (2020), 997–1009. Some countries, like Malawi, appear to be notable outliers, but limited systematic data is available: Jonathan Salerno *et al.*, ‘Risk of Injury and Death from Lightning in Northern Malawi’, *Natural Hazards*, 62 (2012), 853–62.

¹¹Benjamin Franklin, *Experiments and Observations on Electricity, Made at Philadelphia in America* (1769), 417, also cited in E. Philip Krider, ‘Benjamin Franklin and Lightning Rods’, *Physics Today*, 59 (2006), 42–8.

¹²Elsom, ‘Factors’, 343.

¹³Theodore Bernstein and Terry S. Reynolds, ‘Protecting the Royal Navy from Lightning: William Snow Harris and His Struggle with the British Admiralty for Fixed Lightning Conductors’, *IEEE Transactions on Education*, E-21:1 (1978), 7–14.

not only in the historiography, but, as we shall see, in the contemporary published literature aimed at shipboard surgeons and physicians.

Historians of medicine have long studied the tension between the theoretical education received by practitioners and their subsequent experience of disease on the ground. This tension was especially vivid in the early modern period, as the veneration for ancient authority was increasingly flanked by empirical approaches.¹⁴ Ship surgeons, in particular, sailing to new climates and environments, encountered and had to learn to cope with 'strange' diseases: by the end of the eighteenth century, treatment for these, if not their explanation, was often codified and incorporated into their medical training.¹⁵ Lightning injuries, however, offer us a different, valuable case study: they were mostly omitted from naval surgeons' training not because they were completely unknown, but because, especially ashore, they were deemed extremely rare, and thus a low priority. This, I argue, brings into relief two key aspects of late eighteenth- and early nineteenth-century surgeons' backgrounds: first, the blurred boundaries between generalist surgical education and a supposedly specialised field like naval practice; and second, the ultimate distance between prescriptive, treatment-focused manuals and the world of natural philosophy, where descriptive and aetiological studies of lightning were a lively concern. The key factor setting apart philosophical and medical knowledge of lightning was that, while lightning strikes were common, lightning strike victims, let alone survivors, were not.

In the Renaissance, both philosophical and medical scholarship had set a trend of focusing on 'remarkable' and exceptional occurrences, in an attempt to study the 'occult' and test 'the boundaries of the natural, the unnatural, and the supernatural'.¹⁶ By the eighteenth century, however, as Lorraine Daston and Katharine Park have argued, this appetite for 'curiosities', rarities, 'wonders' and 'marvels' had largely faded, suppressed by a dismissal of all 'superstitions' and their attendant risks of unreason and disorder. Enlightened intellectuals' ingrained response to phenomena supposedly deviating from the norm was simply to 'ignore them'.¹⁷ In late eighteenth-century medical treatises, too, pragmatism prevailed. Treatment for some rare incidents, like drowning, attracted disproportionate funding and interest within specific contexts, and 'resuscitation' in general fascinated contemporary medical opinion.¹⁸

¹⁴See e.g. Lori Jones, 'Experience over Education or Education over Experience? Pre-modern Medical Writing on Plague', in *Transforming Medical Education: Historical Case Studies of Teaching, Learning, and Belonging in Medicine in Honour of Jacalyn Duffin*, ed. Delia Gavrus and Susan Lamb (Montreal and Kingston, 2022), 86–111.

¹⁵Iris Bruijn, *Ship's Surgeons of the Dutch East India Company: Commerce and the Progress of Medicine in the Eighteenth Century* ([Amsterdam], 2009), 82–4. On the transformation of naval, military and colonial medicine across the seventeenth and eighteenth centuries, see also *British Military and Naval Medicine, 1600–1830*, ed. Geoffrey L. Hudson (Amsterdam and New York, 2007).

¹⁶Nancy G. Siraisi, "'Remarkable" Diseases, "Remarkable" Cures, and Personal Experience in Renaissance Medical Texts', in Nancy G. Siraisi, *Medicine and the Italian Universities, 1250–1600* (Leiden, 2001), 226–52, quote at 230.

¹⁷Lorraine Daston and Katharine Park, *Wonders and the Order of Nature 1150–1750* (New York, 1998), 329–63.

¹⁸Alexandra Bamji, 'Blowing Smoke Up Your Arse: Drowning, Resuscitation, and Public Health in Eighteenth-Century Venice', *Bulletin of the History of Medicine*, 94 (2020), 29–63.

But this period also saw the first stirrings of modern statistical and epidemiological thinking in medicine, with attention starting to fall on odds and aggregates more than peculiar or individual cases.¹⁹ Military and naval medicine, it has been shown, owing to their focus on manpower needs, were at the forefront of these quantification developments – particularly in Britain.²⁰ Naval physician Gilbert Blane, for example, tabulated all casualties in the West Indian squadron during the American War. In a particularly bad month, such as December 1782, ‘Fever’ alone, he revealed, affected one man out of eleven, ‘Flux’ (dysentery) one out of eighty-six, scurvy one out of 107. The overall mortality was one in 440.²¹ Next to these figures, lightning casualties, with their 1/6,700 annual odds, would simply disappear. As the case of lightning perfectly illustrates, injuries and diseases that were deemed unusual, or incurable, seem to have received proportionately less attention. Yet they remained emotionally charged and symbolically impactful.

The main argument of this article is that lightning strikes, with their awesome manifestations and their serious and poorly understood effects on human bodies, loomed large in many seafarers’ consciousness; as a result, they could play a substantial role in shaping naval shipboard relations between officers and ‘common’ seamen. The relative lack of learned discussion on lightning injuries’ epidemiology, symptomatology, and especially treatment, combined with their suddenness and impressiveness, meant that they constituted a crucial moment of tension for healthcare practitioners’ authority aboard. In the Navy, medical discipline was at all times precarious and negotiated, depending upon seamen’s own trust in, and collaboration with, the surgeon.²² More generally, shipboard environments were diverse and lively, often sizzling with clashing cultures, assorted forms of experience and belief, and strong undercurrents of social friction.²³ The top-down nature of many naval sources means that seamen’s actions are most commonly presented through the filter of officers’ and surgeons’ understanding of them; while this makes the sailors’ motivations and precise belief systems difficult to penetrate, some of these accounts do speak very clearly of tensions, challenges, and crisis. The inexplicable and the baffling, and abrupt death coming in moments of tension and terror, pregnant with the religious and even hellish symbolism of natural

¹⁹Andrea Rusnock, ‘“The Merchant’s Logick”: Numerical Debates over Smallpox Inoculation in Eighteenth-Century England’, in *The Road to Medical Statistics*, ed. Eileen Magnello and Anne Hardy ([Leiden], 2016), 37–54; Ulrich Tröhler, ‘“To Improve the Evidence of Medicine”: Arithmetic Observation in Clinical Medicine in the Eighteenth and Early Nineteenth Centuries’, *History and Philosophy of the Life Sciences*, 10 (1988), 31–40.

²⁰Érica Charters, ‘L’histoire de la quantification: la guerre franco-anglaise et le développement des statistiques médicales’, *Dix-huitième siècle*, 47 (2015), 21–38.

²¹Gilbert Blane, *Observations on the Diseases of Seamen*, 3rd edn (1799), 136.

²²Sara Caputo, ‘Treating, Preventing, Feigning, Concealing: Sickness, Agency and the Medical Culture of the British Naval Seaman at the End of the Long Eighteenth Century’, *Social History of Medicine*, 35 (2022), 749–69.

²³James Davey, *Tempest: The Royal Navy and the Age of Revolutions* (New Haven, 2023); Niklas Frykman, *The Bloody Flag: Mutiny in the Age of Atlantic Revolution* (Oakland, 2020); Elin Jones, ‘Space, Sound and Sedition on the Royal Naval Ship, 1756–1815’, *Journal of Historical Geography*, 70 (2020), 65–73. On ‘ordering as a social process’, see also Richard J. Blakemore, ‘Mutiny on Trial: Law and Order among Seventeenth-Century Seafarers’, *Past & Present*, Supplement 17 (2024), 72–107. On diversity aboard naval ships, see Sara Caputo, *Foreign Jack Tars: The British Navy and Transnational Seafarers during the Revolutionary and Napoleonic Wars* (Cambridge, 2023).

forces, questioned hierarchies of knowledge aboard. Both seamen and naval surgeons, living in constant proximity with the sea, knew very well the effects of drowning or exposure to humidity.²⁴ But when the heavens rumbled and flashed, frequently enough to constitute a concrete danger, but rarely enough for it to feel momentous and shocking, what electricity and the distant sky could do to mariners' bodies was anyone's guess.

This article begins by examining the contemporary context of knowledge about lightning. Then it discusses seafarers' perceptions and experiences of lightning in non-medical contexts. After this, we will consider various instances of shipboard lightning injury, the reactions that they engendered among surgeons and seamen, and, finally, some of the general implications of the study of lightning for maritime historians and historians of medicine.

Studying lightning

Eighteenth- and nineteenth-century naval surgeons, like other seafarers, paid considerable attention to the weather. Their clinical journals often contained detailed meteorological observations: medical topography held significant sway over a branch of the profession that travelled across all climates.²⁵ Treatises on marine medicine and surgery, too, dedicated ample space to the atmosphere, air, and related physical phenomena.²⁶ Yet, on the matter of lightning, they remained relatively unforthcoming.

As the profession boomed during a period of almost uninterrupted global wars, numerous manuals were written by and for the use of seagoing surgeons, in every prominent maritime country. To select but a sample, lightning injuries are notable for their absence in Thomas Trotter's and William Turnbull's popular treatises on the diseases of seamen.²⁷ The same is true of the French and Spanish manuals by Poissonnier Desperrières (1767 and 1780) and Pedro Maria Gonzalez (1805).²⁸ In the 1762 and 1774 editions of James Lind's essay on preserving seamen's health, lightning injuries receive a short section, where we learn that they should be treated with 'a like method' to drowning or suffocation (generic bleeding and, in the 1774 edition, shock with cold

²⁴See e.g. William Turnbull, *The Naval Surgeon: Comprising the Entire Duties of Professional Men at Sea* (1806), 5–8, 69, 228, 305–7; Poissonnier Desperrières, *Traité des maladies des gens de mer*, 2nd edn (Paris, 1780), 82–3.

²⁵See e.g. 'Medical and surgical journal of His Majesty's Ship *Lion* for 29 January 1813 to [29th] January 1814 by John Tweedy Todd, Surgeon', TNA, ADM 101/106/4, fos. 1–21.

²⁶Gilbert Blane, *Observations on the Diseases Incident to Seamen* (1785), 218–81; Turnbull, *Naval Surgeon*, 3–13; Pedro Maria Gonzalez, *Tratado de las enfermedades de la gente de mar, en que se exponen sus causas, y los medios de precaverlas* (Madrid, 1805), 26–63; C. Forget, *Médecine navale, ou nouveaux éléments d'hygiène, de pathologie et de thérapeutique médico-chirurgicales, à l'usage des officiers de santé de la Marine de l'État et du commerce*, 2 vols. (Paris, 1832), I, chs 11–15. On ventilation aboard see also Paul E. Sampson, "'The Lungs of a Ship': Ventilation, Acclimatization, and Labor in the Maritime Environment, 1740–1800", *History of Science*, 61 (2023), 214–35; Guillaume Linte, "'The Salvation of the Seamen': Ventilation, Naval Hygiene, and French Overseas Expansion During the Early Modern Period (ca. 1670–1790)", *Centaurus*, 65 (2023), 31–62.

²⁷Thomas Trotter, *Medicina Nautica: An Essay on the Diseases of Seamen* (3 vols., 1797, 1799 and 1803); Turnbull, *Naval Surgeon*.

²⁸Desperrières, *Traité*; Gonzalez, *Tratado*.

water).²⁹ Some quick advice was also provided by the Physician to the Fleet Sir Gilbert Blane, but this only appears in the third (1799) edition of his treatise on the diseases of seamen, which had first been published in 1785: he recommends the use of ‘cordials and stimulants’ and ‘external warmth’, ‘together with the means for restoring respiration’. Blane, however, directly contradicted Lind, stating that bleeding ‘should be avoided’.³⁰ As late as 1832, instructions remained a little vague: the French text by Charles-Polydore Forget only mentions in passing the danger of electricity at sea, and stresses the need for installing protection; when it comes to strictly medical protocols, it simply describes (quite briefly) one clinical case and again invites the use of ‘internal and external stimulants’ to treat lightning victims, including therapeutic electricity itself.³¹

Lind’s essay, in particular, focusing on prevention more than cure, is paradigmatic of the prophylactic and population-level thinking that prevailed in naval medicine. He does not discuss clinical presentation or prognosis: most of his short entry on lightning is dedicated to explaining that the danger is caused by the masts, and that it can be prevented perhaps by installing conductors, making the men’s clothes wet and keeping them away from masts and connected cordage. ‘The principles upon which those advices are founded,’ he concludes, ‘are too well known to require my dwelling longer on this subject’.³² This sentence illustrates the kernel of the problem: knowledge (or often, as we shall see, assumed knowledge) of natural ‘principles’ was in fact rather distinct from the practical and therapeutic knowledge required to *respond* to lightning injury.

In contemporary natural philosophy, lightning was a much-discussed phenomenon: most famously, Benjamin Franklin’s experiments with electricity in the 1740s and early 1750s had sparked significant debates on the behaviour of this type of ‘meteor’, and on the optimal shape of protective lightning rods.³³ In the wake of Franklin’s studies, public lectures in experimental philosophy covered techniques for ‘personal security’ and defence from lightning – the same emphasis that we noted in Lind.³⁴ Natural philosophers studying electricity also concerned themselves with its behaviour within and effects upon human and animal bodies: was the electric fluid principally conducted through the nerves or through blood?³⁵ Did animal hair of different colours conduct

²⁹James Lind, *An Essay on the Most Effectual Means of Preserving the Health of Seamen in the Royal Navy ...*, 2nd edn (1762), 42–4; new [3rd] edn (1774), 46–8.

³⁰Blane, *Observations* (1799), 548.

³¹Forget, *Médecine navale*, I, 164, 179; II, 282–3.

³²Lind, *Essay* (1774), 47–8.

³³R. W. Home, ‘Points or Knobs: Lightning Rods and the Basis of Decision Making in Late Eighteenth Century British Science’, *Transactions of the American Philosophical Society*, New Series, 99 (2009), 97–120 (and see the whole special issue); Krider, ‘Benjamin Franklin’; Paul A. Tunbridge, ‘Franklin’s Pointed Lightning Conductor’, *Notes and Records of the Royal Society of London*, 28 (1974), 207–19.

³⁴William Johnson, *A Course of Experiments, In That Curious and Entertaining Branch of Natural Philosophy, Call’d [sic] Electricity* (New York, 1765), 8; James Dinwiddie, *Syllabus of a Course of Lectures on Experimental Philosophy* (1789), 4; Henry Moyes, *Syllabus of a Course of Lectures on the Philosophy of Natural History* ([1790]), 8–9; T. Garnett, *Outlines of a Course of Lectures on Natural & Experimental Philosophy* (Glasgow, 1796), 7–9; Edward Athenry Whyte, *Syllabus of a Course of Experimental Philosophy* ([Dublin], [1797]), 2–4.

³⁵John Lyon, *An Account of Several New and Interesting Phenomena, Discovered in Examining the Bodies of a Man and Four Horses, Killed by Lightning, near Dover*, in Kent (1796), esp. 9, 17–18, 29–37.

lightning differently?³⁶ Could victims, if their bodies were charged positively or negatively by contact with a thunder cloud, be killed even at a great distance by a 'returning stroke', mainly showing signs of its passage in their feet and legs?³⁷ These philosophical studies, however, only had a preventative or explanatory aim: they concerned themselves with causes, rather than effects, and description, rather than therapy. As discussed below, they also tended to reach naval medical personnel only in a partial and idiosyncratic fashion.

British Navy physicians and even surgeons studied for long periods ashore before embarking with a naval warrant. Some undertook apprenticeships, but many also attended university and teaching hospital courses. As a result, while their medical education came with some practical experience of surgery, it was often theoretically grounded in the key anatomical and pathological debates of the time.³⁸ In these, the supposed therapeutic properties of electricity and the theological implications of its use for healing featured prominently.³⁹ Because of the overall rarity of lightning casualties, however, how one should treat individuals *harm*ed by electricity, if at all possible, seems to have remained an underexplored question in civilian medicine.

The Royal Humane Society, which campaigned for the reanimation of drowned casualties, occasionally mentioned lightning accidents in its annual reports. The hope was that these stories – including curious ones like the case of a struck ploughman revived by hail – would be 'productive of medical attention', convincing practitioners that resuscitation was possible.⁴⁰ The examples, however, remained brief, sparse, and only accessible to those who happened to read the proceedings in full. Only from the early 1800s did these publications start to include a two-page note entirely on lightning; except for the final paragraph, the advice again focused on prevention rather than treatment.⁴¹

³⁶James Lambert and William Green, *An Account of a Very Extraordinary Effect of Lightning on a Bullock, at Swanborow, in the Parish of Iford near Lewes, in the County of Sussex* (1776).

³⁷Charles Viscount Mahon [later Earl Stanhope], *Principles of Electricity, Containing Divers New Theorems and Experiments, together with an Analysis of the Superior Advantages of High and Pointed Conductors* (1779), 119–22, 124–31; Charles Earl Stanhope, *Remarks on Mr. Brydone's Account of a Remarkable Thunder-Storm in Scotland* (1787). 'Positive' and 'negative', at the time, meant a body containing 'more' or 'less' electricity than in the 'natural state': Stanhope, *Remarks*, 16.

³⁸M. John Cardwell, 'Royal Navy Surgeons, 1793–1815: A Collective Biography', in *Health and Medicine at Sea, 1700–1900*, ed. David Boyd Haycock and Sally Archer (Woodbridge, 2009), 38–62, at 45–53; Michael Crumplin, 'Surgery in the Royal Navy during the Republican and Napoleonic Wars (1793–1815)', *ibid.*, 63–89, at 65–71, 73. Manon C. Williams is also conducting excellent research into naval surgeons' careers.

³⁹Paola Bertucci, 'Revealing Sparks: John Wesley and the Religious Utility of Electrical Healing', *The British Journal for the History of Science*, 39 (2006), 341–62; *Electric Bodies: Episodes in the History of Medical Electricity*, ed. Paola Bertucci and Giuliano Pancaldi (Bologna, 2001); Geoffrey Sutton, 'Electric Medicine and Mesmerism', *Isis*, 72 (1981), 375–92.

⁴⁰*Reports of the Humane Society. ... For the Years M.DCC.LXXXV and M.DCC.LXXXVI ([1787?])*, 110; *Humane Society: For the Recovery of Persons Apparently Dead by Drowning ([1787?])*, 26–8, available at Wellcome Collection <https://wellcomecollection.org/works/u6wkqjwg>; *Transactions of the Royal Humane Society from 1774 to 1784: With an Appendix of Miscellaneous Observations on Suspended Animation, to the Year 1794 – Vol. 1 ([1795])*, 196–202; W. Hawes, *Royal Humane Society, 1774: Annual Report, 1799 ([1799])*, 23–4; W. Hawes, *Royal Humane Society, 1774. Annual Report, 1803 ([1803])*, 64, 66–8.

⁴¹See e.g. *Annual Report of the Royal Humane Society. 1809 ([1810])*, 20–2.

The more generalist journal *Medical Facts and Observations*, too, referred to a single lightning casualty between 1791 and 1800, although it did publish several articles on therapeutic electricity and a range of other rare and outlandish clinical cases.⁴² The patient discussed was a soldier who had been suffering from impaired eyesight and stomach problems, and ‘dated the origin of his complaints’ to the day he had been close to lightning. The author of the report, a military surgeon clearly unfamiliar with this very typical symptom, suspected ‘that the affection of the eyes was of a longer standing than’ the victim ‘was willing to acknowledge’, and attempted to treat the paralysed stomach instead. Yet he was utterly baffled by the progression of the illness and ‘the unaccountable combination and appearance of the symptoms’; soon, the patient died. Upon dissection, the stomach was found full of gangrene. At that point, the surgeon retreated into agnosticism: ‘How far lightning may have been the occasional cause of the disease,’ he concluded, ‘I shall leave to the investigation of others, whose researches lead them to inquire into the relative nature of the electric fluid and the nervous influence.’⁴³ Again, the philosophical and the therapeutic tended to operate as separate areas of expertise.

Similarly, in *The London Medical Journal*, the predecessor of *Medical Facts and Observations* and a much larger publication, lightning was mentioned a total of three times between 1781 and 1790 – all of them very quick listings of reports published by medical societies in Paris and Copenhagen. One entry pointed to a case of lightning-induced ocular spasm, deemed incurable; in another, the most extensive at just over six lines, the point of interest was a natural curio, stated rather than discussed: the fact that the metallic instruments in the pocket of the strike survivor were still strongly magnetised six weeks later.⁴⁴ In short, available studies and reports on lightning injuries were sporadic, underdeveloped, and swayed by doubts and non-clinical tangents.

The few practitioners who did write more systematically about this matter noted that the impression of divine intervention generated by lightning casualties had long hampered their treatment, cast as both ‘vain’ and ‘presumptuous’. Even as he attempted to contrast this attitude, as late as 1798, physician Anthony Fothergill could still describe cases of recovery as ‘singular instances’ and ‘remarkable cures’.⁴⁵ At sea,

⁴²The journal archive is at ‘Lond Med J’, *National Library of Medicine – National Center for Biotechnology Information*, <https://www.ncbi.nlm.nih.gov/pmc/journals/2818/#londmedj>.

⁴³Patrick Paterson, ‘Case of Gangrenous Stomach, with Dysphagia, from Lightning: Communicated in a Letter to Dr. Simmons’, *Medical Facts and Observations*, 8 (1800), 111–21.

⁴⁴Acta Societatis Medicæ Havniensis. Volumen II’, *The London Medical Journal*, 1 (1781), 377–401, at 387; ‘Memoirs of the Royal Medical Society at Paris’, *The London Medical Journal*, 3 (1782), 273–93, at 285; ‘Memoirs of the Royal Medical Society at Paris, Vol. II’, *The London Medical Journal*, 4 (1783), 358–73, at 367.

⁴⁵A. Fothergill, *Preservative Plan, or Hints for the Preservation of Persons Exposed to Those Accidents Which Suddenly Suspend or Extinguish Vital Action, and by Which Many Valuable Lives Are Prematurely Lost to the Community* (1798), 15. For remedies see also A. F. [Anthony Fothergill], *Farther Hints for Restoring Animation, and for Preserving Mankind against the Pernicious Influence of Noxious Vapours, or, Contaminated Air, in a Second Letter to Dr. Hawes* (1783), 110–13; [John Fothergill], ‘Observations on a Case published in the last Volume of the Medical Essays, &c. “of recovering a Man dead in Appearance, by distending the Lungs with Air. Printed at Edinburgh, 1744” – Read before the Royal Society, February 21, 1745’, in *The Works of John Fothergill, M.D.*, ed. John Coakley Lettsom (1784), 147–51, at 149–50. For instances of doctors confused by lightning symptoms in the 1850s see Elsom, ‘Factors’, 347.

being hit by lightning and living to tell the tale was not particularly unusual: such occurrences were documented at least from the seventeenth century.⁴⁶ Naval surgeons' professional development once in the service continued rapidly; but amid the abundant diseases and injuries that befell seafarers in wartime, the effects of lightning on human bodies were often an emergency for which, in their training ashore, they had not been specially prepared.

Witnessing and experiencing lightning at sea

If medical seafaring manuals were elusive on the matter of lightning, this is by no means true of mariners' and naval officers' writings. Anyone who spent time at sea would, sooner or later, witness the majestic and terrifying power of lightning over the ocean. They would also learn to distinguish one type of lightning from the other.

Ships fighting their way through a storm were a frequent subject in seventeenth-, eighteenth- and nineteenth-century art. Yet few of these paintings give much space to lightning, which can be very difficult to capture on canvas.⁴⁷ The French landscape artist Claude-Joseph Vernet was an important exception, depicting clear lightning bolts, but, in most other renderings of marine tempests, all a viewer could see were patches of brightly lit clouds amidst black brooding skies.⁴⁸ Seafarers, instead, tended to be more precise than painters in their accounts, describing phenomena that range from the standard shapes expected of electric discharges to a myriad of unusual sights. While George Vancouver, for example, writes of 'extremely vivid forked lightning' in the North Pacific in December 1791, not all lightning looked as stereotypical.⁴⁹ In August 1772, off the Cape Verde Islands, the naturalist Johann Reinhold Forster, embarked in HM Sloop *Resolution*, reports 'a fiery meteor, of an oblong shape, a bright but blueish light, and descending towards the North West, and then moving in an oblique direction towards the horizon'.⁵⁰ Two years later, in New Caledonia, his crew observed a 'pale', 'luminous globe', which 'burst' with 'a loud hissing, similar to that caused by oakum when set on fire', then emitting 'several bright sparks', 'the lowermost of which had the shape of a pear, and could be traced by a blueish light it left

⁴⁶John Kempthorne, 19 Jan. 1677 [1678?], TNA, Navy Board: Records, In-Letters, Miscellaneous, K.-L., 1678, ADM 106/336, fos. 21-2: 'fower [sic] men were stricken dead for y^e p[re]sent, but are upon recovery'.

⁴⁷On the difficulty of capturing atmospheric phenomena visually see also Fiona Amery, 'Capturing the Northern Lights: Standardizing the Practice of Auroral Photography during the Second International Polar Year, 1932-1933', *Historical Studies in the Natural Sciences*, 52 (2022), 147-89, esp. 154.

⁴⁸Claude-Joseph Vernet, *The Shipwreck* (1772), National Gallery of Art, <https://www.nga.gov/collection/art-object-page.111194.html>; Claude-Joseph Vernet, *Tempête* (1772), The National Gallery, <https://www.nationalgallery.org.uk/paintings/claude-joseph-vernet-a-shipwreck-in-stormy-seas>. For examples of generic storm light, see the foundational marine work by the van de Velde studio: 'Willem van de Velde', *The National Gallery*, <https://www.nationalgallery.org.uk/artists/willem-van-de-velde>; Johan van der Hagen, *English Ships in a Storm* (1714), Greenwich, National Maritime Museum, BHC0993, <https://www.rmg.co.uk/collections/objects/rmgc-object-12485>.

⁴⁹George Vancouver, *A Voyage of Discovery to the North Pacific Ocean, and round the World*, 3 vols. (1798), I, 72.

⁵⁰John Reinhold Forster, *Observations Made during a Voyage round the World, on Physical Geography, Natural History, and Ethic Philosophy* (1778), 119.

behind'.⁵¹ These vivid images and sensory experiences transcended the visual codes of the average land-based artist – or of most individuals before they went to sea.

Some naval officers cultivated a direct interest in natural philosophy. For instance, Captain Basil Hall, in January 1839, wrote to the French astronomer and meteorologist François Arago, at the Observatoire Royal in Paris, to supply him with potentially useful information. The letter reported verbatim an account of lightning striking HMS *Rodney* in the Mediterranean: 'luckily the sail was wet', which prevented a larger flame, but lightning 'entered the [main] mast just under the larboard cheek piece, & came out at the starboard side about six feet from the deck in a globe of fire, passed over the Hammock cloth, & fell into the water'. Two men died and the commander 'felt quite stunned, but saw distinctly the globe of fire come out of the mast'. Hall told Arago admiringly that he was 'half through' ('(p 379)') his *Notice sur le Tonnerre*, which he read 'with the liveliest interest', and that he was soon to receive a command: 'it will give me great pleasure, should I be so fortunate, to execute any commission, respecting Thunder or Lightning, or anything else, with which you may be pleased to honor me'.⁵² Encountering lightning and observing its peculiar behaviour, for Hall's enthusiastic and inquisitive mind, could somehow be an occasion of 'great pleasure': the most horrific accident would then become a matter of fascination.

Sometimes, seafarers without specific scientific interests also saw lightning as a magnificent, sublime spectacle. During his deployment off the Danish coasts in August 1807, Charles Chambers, surgeon of HMS *Prometheus*, 'walked the deck nearly the first watch to enjoy the sight':

some of the most vivid and awful lightning I ever beheld (equally tremendous with that experienced on the memorable night of rejoicing for Peace, in London) which at every flash illuminated the hemisphere and presented to the eye one of the most brilliant scenes imagination can conceive, viz our Fleet and Transports, consisting of 300 sail, riding at anchor in the Roads, and Elsinour Castle on shore.⁵³

This was a genuine passion: a couple of weeks later, in the middle of the British operation against Copenhagen, again we find him 'walking the deck to admire the lightning' (22 August) and 'engrossed' by 'some very vivid lightning' (24 August).⁵⁴ In the Enlightenment, initially sentiments of 'curiosity' and 'wonder', and later the experience of the 'sublime', rather than fear in the face of powerful phenomena, had turned into 'the self-conscious mark of the natural philosopher freed from the yoke of ignorance and enthusiasm', as Daston and Park put it.⁵⁵ No doubt, gentlemanly cultural codes could set apart officers' and sailors' attitudes on the matter of thunderstorms. Still, the dangers of lightning were real. This very sense of fascination and awe, then,

⁵¹ *Ibid.*, 119–20.

⁵² Basil Hall to Mons.^r Arago, 28 Jan. 1839, London, Wellcome Collection, MS.8914/1.

⁵³ 'The Bombardment of Copenhagen, 1807: The Journal of Surgeon Charles Chambers of H.M. Fireship *Prometheus*', in *The Naval Miscellany*, III, ed. W. G. Perrin (1928), 365–466, at 379.

⁵⁴ *Ibid.*, 393, 396.

⁵⁵ Daston and Park, *Wonders*, 336–7, 345, 362–3.

was partly what primed seafarers of all ranks for more terrified reactions when the vivid celestial light did strike them.

Indeed, rather than simply constituting dramatic backstage illumination, lightning directly interacted with ships. While there were geographical and seasonal hotspots, vessels were smashed and scorched by it nearly everywhere and at any time. In June 1766, we encounter the schooner *St. Lawrence* 'Blowing up by Lightning' at Cape Breton Island, and a hundred pounds being spent by its commander to hire auxiliary vessels and try to save some of the shipboard stores.⁵⁶ In October 1795, the Commander of HMS *Russell*, in the Channel, reported that it 'was struck by lightning which split our main and mizen masts all to pieces, split the main topsail, also killed our first lieutenant and two men. Several others much wounded.' The following day, the damaged vessel had to be assisted by carpenters from other ships.⁵⁷ In the summer of 1802, in the Mediterranean, HMS *Gibraltar* and HMS *Active* had their foremasts and a few of their topmasts wiped away by lightning.⁵⁸ In Rio de Janeiro, on 21 March 1814, HMS *Nereus* 'was unfortunately struck by lightning and her main mast so much shattered as to require considerable repairs'. These took five days, and again necessitated the help of 'artificers' belonging to other vessels, delaying an important diplomatic mission.⁵⁹ Similar cases are ubiquitous across naval records and stations all over the world.⁶⁰ For the period between 1799 and 1815 alone, inventor William Snow Harris counted 100 masts destroyed by lightning, with one ship out of every eight of those hit also being 'set on fire', and one in ten 'completely disabled'.⁶¹ Damage could also be more subtle, but equally catastrophic: lightning strikes could magnetise iron in the ship, which put compasses out of service and hampered navigation. The issue was studied by natural philosopher Gowin Knight in the early 1750s: he concluded that it could be solved by amending the shape of needles and removing iron from compass boxes and binnacles; supposedly better-built compasses with those characteristics were adopted by the Royal Navy, but they remained too expensive for many merchantmen, and their quality and usefulness were widely disputed.⁶²

⁵⁶Ralph Dundas, 2 Sep. 1766, TNA, Miscellaneous in-letters to the Navy Board from B-H correspondents, 1766, ADM 106/1144, fo. 133.

⁵⁷*The Channel Fleet and the Blockade of Brest, 1793–1801*, ed. Roger Morriss (Aldershot, 2001), 134.

⁵⁸John Aylmer, 29 Sep. 1802, TNA, Admiralty: Letters from Captains, Surnames A., 1801–4, ADM 1/1450, fo. 168.

⁵⁹'Bowles to Dixon, *Aquilon*, at Rio de Janeiro, 11 April 1814', in *The Navy and South America 1807–1823: Correspondence of the Commanders-in-Chief on the South American Station*, ed. Gerald S. Graham and R. A. Humphreys (1962), 138.

⁶⁰For a few hundred examples, see Harris, *Remarkable Instances*, 35, 39–56. For a seventeenth-century instance, see 'Naval Operations in the Latter Part of the Year 1666', in *Naval Miscellany*, III, ed. Perrin, 5–47, at 7.

⁶¹Harris, *On the Nature*, vii.

⁶²A letter from captain John Waddel to Mr. Nap[h]thali Franks, merchant, concerning the effects of Lightning in destroying the polarity of a mariner's compass', in *A Collection of Some Papers Formerly Published in the Philosophical Transactions, Relating to the Use of Dr. Knight's Magnetical Bars, With Some Notes and Additions* (1758), 17–18; 'An account of the mariners compass, that was struck with lightning, and shewn at the last meeting of the Royal Society ... communicated by Gowin Knight, M. B. F. R. S.', *ibid.*, 19–23. On Knight's compasses see Patricia Fara, *Sympathetic Attractions: Magnetic Practices, Beliefs, and Symbolism in Eighteenth-Century England* (Princeton, NJ, 1996), ch. 3.

From the 1770s onwards, various ships in the British Navy carried removable 'electric chains', a device already proposed by Franklin in the early 1750s, which could be secured at the top of the masts to channel the discharge down to the water.⁶³ These, however, did not work well if a crew was caught by surprise: Johann Reinhold Forster, for example, describes how in Tahiti one of the *Resolution's* seamen was electrocuted while arranging the chain around the rigging.⁶⁴ William Snow Harris, who from the 1820s onwards was leading a campaign to introduce proper conductors in the Navy, decried these early non-permanent attempts as too 'dependent on the prejudices of sailors, for due care and attention', as well as being unable to 'satisfy all the conditions of the problem, or meet the many difficult circumstances in which the general fabric of a ship, in all its casualties, may become placed': sometimes, the strikes approached a vessel 'obliquely', hitting the yard-arms first.⁶⁵ Even when they may have felt some initial 'temporary excitement' towards these conductors, he observed, the sailors 'eventually' came to 'believe they may be as well without them, as incur the risk and trouble they involve', and the chains ended up 'neglected'.⁶⁶ While he seems reluctant to couch matters in these terms, the attitudes that he dismissively labels as 'prejudices' probably reflected a conscious risk-effort-benefit assessment, developed by the mariners through direct experience of climbing masts, weathering thunderstorms, and observing how these behaved. Overall, electric chains both invited haphazard use and failed to cater for lightning's own haphazardness. Harris's answer, we saw, consisted of systematising knowledge of the behaviour of electrical discharges around ships, by meticulously cataloguing every strike recorded in several decades' worth of naval journals. This quantitative approach returned patterns, and pointed to the utility of the fixed conductor that he was attempting to promote.⁶⁷

Cold analytical detachment, however, strips away most of the essence of close encounters with lightning. The way in which lightning struck often left a strong impression on survivors, and is recounted in quasi-apocalyptic tones by officers and seamen alike. For example, a French naval surgeon stationed off the Gold Coast in 1790 describes the thunderstorms there in his journal as 'a scene of horror and terror':

the sky is of a dreadful darkness, one can't see but the light of the lightning. The manoeuvres are distinguished only by habit. Traces of flaming sulphur departing from all sides, the thunder rumbles, bursts and breaks in the air, the wind whistles, the sea sparkles with sulphuric fires, rises with force and soon would form a tempest ...⁶⁸

⁶³Bernstein and Reynolds, 'Protecting'; Krider, 'Benjamin Franklin', 43, 45.

⁶⁴Forster, *Observations*, 119.

⁶⁵Harris, *Remarkable Instances*, 4, 15–17.

⁶⁶Harris, *On the Nature*, 153.

⁶⁷Harris, *Remarkable Instances*; W. Snow Harris, 'LX: On the Course of the Electrical Discharge, and on the Effects of Lightning on Certain Ships of the British Navy', *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 16 (1840), 404–17. On the development of the conductor, see Bernstein and Reynolds, 'Protecting'; Anon., 'Naval Improvements of the Nineteenth Century: Lightning Conductors', *Colburn's United Service Magazine and Naval and Military Journal – Part II* (1843), 348–61, 495–505.

⁶⁸Mr Moras, 'Journal Médico-Historique de la Campagne de la Frégate du Roy "La Félicitée"', commandée par Monsieur De Grimouard, Capitaine de Vaisseau en Chef de la station De la Côte d'Afrique', 5–9

Similarly, Commodore George Anson's ship chaplain, recalling a storm that the squadron faced off the Pacific coast of South America in 1741 (only one of a series of 'disasters, fatigues, and terrors'), provided the following description:

In one of these squalls, which was attended by several violent claps of thunder, a sudden flash of fire darted along our decks, which, dividing, exploded with a report like that of several pistols, and wounded many of our men and officers as it passed, marking them in different parts of the body: This flame was attended with a strong sulphureous stench, and was doubtless of the same nature with the larger and more violent blasts of lightning which then filled the air.⁶⁹

Lightning was not just a visual spectacle: it involved nearly all other senses, coming accompanied by the roaring sound of thunder, the whistling of the wind, the burning heat of fire, and a sulphureous smell that could easily take infernal connotations. This smell of sulphur or 'brimstone', described in various early modern and eighteenth-century sources, baffled naturalists.⁷⁰ At the start of the eighteenth century, lightning was still seen as the chemical product of sulphureous and nitrous vapours in the air; by the 1840s, Harris supposed that the smell might derive from 'traces' of 'various kinds of matter being dragged and transported into the track of the electrical discharge'.⁷¹ Yet a full explanation remained elusive. Instead, the biblical associations were stark: in the Old Testament as in the New, 'fire and brimstone' were a recurrent symbol of God's wrath and judgment, visited, for example, upon Sodom and Gomorrah.⁷² More generally, in both Christian and pagan cults, lightning and thunder had long been associated with divine will and intervention.⁷³ We can see the religious implications in the language used by Anson's chaplain: those hit by lightning were 'marked'. These marks may have been normal burns, dramatised in the writer's colourful language. However, it is also possible that he was describing what is known as 'Lichtenberg figures': unique reddish, lightning-shaped patterns that can develop on the bodies of those struck; they heal rapidly, but their appearance is disconcerting.⁷⁴ They were first discussed by the German natural philosopher Georg Christoph Lichtenberg in 1777, but he and other

May 1790, Rochefort, Bibliothèque de l'ancienne École de médecine navale, Rapports de fin de campagne, tome 1, rapport no. 1, no. d'inventaire 10 877-1, localisation 61-F, transcript (my translation).

⁶⁹A *Voyage Round the World, in the Years MDCCXL, I, II, III, IV*, by George Anson, Esq. ..., ed. Richard Walter, 8th edn (1756), 144.

⁷⁰See Stanhope, *Remarks*, 5; *An Account of a Thunder Storm; and of a Remarkable Fossil* (1773), 4, 10. A sixteenth-century example referring to brimstone is reported in *Observations on the Burning of the Steeple of St. Paul's Cathedral, London. By the Rev. S. Denne. In a Letter to Mr. Gough. Read at the Society of Antiquaries May 17, 1792* ([1792]), 4.

⁷¹A *True and Particular Account of a Storm of Thunder & Lightning, which fell at Richmond in Surrey, on Whit Sunday last in the Afternoon, being May 20th, 1711* (1711), 6-8, 14-15, 19; Harris, *On the Nature*, 40-2. See also Sanne Steen, 'Annotating the Smell of Lightning', *Odeuropa* (30 Oct. 2021) <https://odeuropa.eu/2021/10/annotating-the-smell-of-lightning/>.

⁷²See e.g. Genesis 19:24; Luke 17:29; Psalms 11:6; Ezekiel 38:22.

⁷³Christian Fuhrmeister, "'Eripuit Caelo Fulmen Sceptrumque Tyrannis': The Political Iconography of Lightning in Europe and North America, 1750-1800", *Transactions of the American Philosophical Society*, 99 (2009), 144-63, at 147-8; Bertucci, 'Revealing Sparks'.

⁷⁴Dario Raniero *et al.*, 'Unusual Lichtenberg Figures in a Lightning Strike's Victim: Case Report and Literature Review', *Legal Medicine*, 56 (2022), 102028.

contemporary scholars observed them in objects rather than on people, and awareness of the codification of this physical phenomenon may not have reached seafarers or surgeons – which, we shall see, was a common pattern.⁷⁵ The ships themselves were branded by lightning, too, in ways perhaps evocative of cursed vessels of maritime lore. In one, in 1799, the sails were suddenly ‘turned’ black.⁷⁶ And even beyond religion, thunderstorms carried experiential connotations reminiscent of battle and death: the lightning itself, by some accounts, produced ‘a noise similar to the whizzing of musket-balls’.⁷⁷ The lightning ‘plays all around us,’ wrote sailor Samuel Leech in 1841, ‘and, as it strikes the water, it hisses like red-hot iron’.⁷⁸

In this context, deep fear inevitably ran through the ranks. A 1767 treatise on dysentery by naval surgeon John Coakley Lettsom observed that, in his experience, lightning and thunder could often induce diarrhoea in scared seamen.⁷⁹ Various other accounts, such as the one that opened this article, report how panic seized stricken crews. The seamen’s terror was amply justified.

The medical consequences of lightning

As shipboard acting surgeon T. W. Jewell put it in 1837, in a note at the end of his journal,

The effects of lightning are at all times dreadful, if not fatal & more especially on the Ocean, and offers one of the most alarming casualties to which the Sailor is exposed in the execution of his duties, and often its power so great, so sudden; its influence so pervading, acting as it does thro’ the entire nervous system, either at once annihilating the vital powers, or if not so severe, leaving behind it vestiges of its serious influence ...⁸⁰

In short, injuries caused by electrical discharge were ‘alarming’ because they were both abrupt and likely to prove serious. Additionally, their symptomatology was complex, and efficacious treatment often counterintuitive.

Lightning was certainly sudden and baffling, for all those involved – victims and witnesses alike. John Lovey, a twenty-four-year-old aboard HMS *Edgar* in 1798, ‘lost the first joint of his left thumb, in consequence of the lightning but’, the *Edgar*’s surgeon continued in his report, ‘can give no account in what manner; is otherwise perfectly well & not the least affected’. The wound was not very painful, although it took about a month to heal.⁸¹ Two men were struck by lightning in HMS *Cruizer* in April 1837:

⁷⁵Yuzo Takahashi, ‘Two Hundred Years of Lichtenberg Figures’, *Journal of Electrostatics*, 6 (1979), 1–13.

⁷⁶HMS *Fisgard*, 22 February 1799, cited in Harris, *Remarkable Instances*, 44. Ghost ships were often black: Horace Beck, *Folklore and the Sea* (Brattleboro and Lexington, 1983), 392, 399, 405.

⁷⁷Harris, *Remarkable Instances*, 30.

⁷⁸Samuel Leech, *Thirty Years from Home, or a Voice from the Main Deck Being the Experience of Samuel Leech* ..., 15th edn (Boston, MA, 1843), 289.

⁷⁹‘A Treatise on Dysentery’, c.1767, Wellcome Collection, MS.MSL.34, fo. 50; Convertito, ‘Health’, 77.

⁸⁰Medical and surgical journal of His Majesty’s sloop *Cruizer* for 1 July 1836 to 28 July 1837 by T W Jewell, TNA, ADM 101/95/3B, fo. 20v.

⁸¹Medical Journal of His Majesty’s Ship *Edgar* of 74 guns by Reginald Williams, Surgeon, from the 15 August 1798 to the 27 July 1799, TNA, ADM 101/98/3B, fo. 43.

afterwards, nineteen-year-old James Lucas ‘knew nothing of the accident further than that [?] he was previously standing under the forecandle’; his shipmate Peter Kerry, boatswain’s mate, who had been struck unconscious and nearly killed, was ‘incapable of saying how the present accident had been induced: farther than he was previously standing near the forebits releasing the watch indeed he knows nothing about it’.⁸² This ‘retrograde amnesia’ is, today, a recognised symptom in many lightning victims.⁸³ But such cognitive distortion could only have added to the shock and mystery of the event.

Not only did lightning strike out of nowhere: it could also affect those it hit with a range of varied and debilitating symptoms, which challenged prediction, categorisation, and often treatment. Benjamin Smith, struck in 1814 aboard HMS *Palma*, was contused and ‘lost a great deal of skin from the arm, back, and breast’, causing him ‘intolerable pain’; ‘his body & cloths smelled strong[?] of sulphur’.⁸⁴ Among his shipmates, various others suffered from temporary paralysis and loss of feeling in different parts of their body, as well as scorched skin – in one of them, this ‘twisted up into little knots like the coarse[?] side of a piece of french cloth’ on ‘his backe side & loins’, which ‘had lost all muscular power’; his description of his feelings at the time was simply ‘a peculiar uneasiness’ in the affected areas.⁸⁵ The surgeon did what he could, but most of the treatments he applied were recycled from other ailments. For example, ‘The sores were treated as simple ulcers, and the disease[?] as an Inflammatory[?] Fever’. The man with loss of feeling and knotted skin was given a purgative and ‘rubbed with strong camphorated ointment [*sic*] evening & morning’. Additionally, paralysed limbs received ‘cold bathing’, and men with stronger systemic reactions were bled, purged and kept on a ‘low diet’.⁸⁶ James Taylor, hit in January 1832 ‘off the coast of Portugal’ and presenting ‘H[ea]d ache and vertigo’, as well as ‘burning sensation’ and ‘numbness’ in his right arm and breast (*Vulnus cum Aura Electrica*), was purged and frictioned ‘with strong ardent Spirits’, and barely escaped a bleeding: ‘It is probable that I should have had recourse to Venae section in this mans case,’ reported his surgeon in the margin, ‘had not the boisterous state of the weather prevented it’.⁸⁷ As we have noted, already thirty years before, Blane had discouraged the use of bleeding in lightning victims: protocols remained uncertain.⁸⁸

Prognosis was also extremely difficult. All the surviving patients in the *Palma* were cured, and the same was true of another mass accident that happened aboard HMS *Dispatch* in January 1832, when more than twenty men were struck, ‘but they all recovered in the course of a few days’.⁸⁹ In other cases, even partial recovery seemed a miracle: Peter Kerry, aboard HMS *Cruizer*, was initially given for all but dead. When

⁸²TNA, ADM 101/95/3B, fos. 15, 13.

⁸³Thomas Powell, Aubri Charnigo and Jennifer Yee, ‘Lightning Strike’, *Journal of Education and Teaching in Emergency Medicine*, 7 (2022), 78–106, at 100; V. Cooray, C. Cooray and C. J. Andrews, ‘Lightning Caused Injuries in Humans’, *Journal of Electrostatics*, 65 (2007), 386–94, at 391.

⁸⁴TNA, ADM 101/112/1, fo. 12r.

⁸⁵*Ibid.*, fos. 12r–12v.

⁸⁶*Ibid.* On using ‘strong friction’ on lightning victims see also, briefly, [Fothergill], *Farther Hints*, 113.

⁸⁷‘Medical and surgical journal of HMS *Dispatch* for 24 May 1831 to 7 February 1832 by L Ramsay, Surgeon’, TNA, ADM 101/97/1A, fo. 9v.

⁸⁸Blane, *Observations* (1799), 548.

⁸⁹TNA, ADM 101/97/1A, fos. 9v–10v, 12r–12v, 14v–15r.

lightning struck him, just before dawn on 20 April 1837, besides being 'severely' burnt, he was 'laying [sic] on his back perfectly senseless, eyes fixed, respiration exceedingly laboursome, irregular at long intervals & stertorous, with frothy saliva issuing from the mouth at each convulsive expiration, pulse small, irregular, and scarcely perceptible; skin cold; limbs flaccid, every thing indicating the almost total extinction of life.'⁹⁰ He was bled 12 ounces of 'very dark blood', 'flowing but slowly'. After forty-five minutes or so, he recovered some consciousness and was given brandy with water '(strong, warm & spiced)'; another thirty-five minutes later he came to. He was invalided from the service after two weeks of convalescence, because he had suffered damage to his nervous system not deemed likely to heal. Yet, he had survived.⁹¹ In modern emergency medicine, specialists speak of 'reverse triage' in case of mass lightning casualties, because, quite unusually, a struck patient who is 'pulseless and apneic' and may 'appear to be dead' is in fact liable to be resuscitated, and should be attended to immediately rather than deprioritised as lost.⁹² As we saw above, the Royal Humane Society had also been pointing this out for a while.⁹³ Nonetheless, their campaign was still very much ongoing; aboard eighteenth- and nineteenth-century ships, this counter-intuitive presentation may have resulted in the impression of an extraordinary occurrence when treated victims recovered. Similarly, 'keraunoparalysis', a flaccid numbness of the limbs uniquely caused by lightning and often accompanied by 'cyanotic' (livid) skin, is now well documented, and known to be generally only temporary.⁹⁴ However, paralysed and numb limbs are extremely distressing types of injury, and they would have often foreshadowed amputation in a shipboard world where blunt force accidents and sepsis were common occurrences.⁹⁵ That men would come back from these kinds of critical trauma could not normally be hoped, let alone predicted.

A positive outcome, in fact, could never be taken for granted, even in cases where damage was less extensive, or not immediately apparent. Seaman William Knox, a nineteen-year-old aboard HMS *Abercrombie* in 1809, had 'formerly' 'lost the sight' in his left eye as a result of lightning; now, he suddenly complained of 'a violent inflammation [sic]' in the other, leaving his vision completely impaired.⁹⁶ The surgeon did not draw an explicit connection between the two episodes (though he clearly found the fact worth mentioning), but some of the symptoms that he describes are consistent with late-onset cataract, nowadays well recognised in lightning victims: this can take 'days or years' to develop.⁹⁷ The physical consequences of lightning could reach survivors after a long time, like a sword of Damocles.

⁹⁰TNA, ADM 101/95/3B, fo. 13.

⁹¹*Ibid.*, fos. 13–14.

⁹²Powell *et al.*, 'Lightning Strike', 98; Rick van Ruler *et al.*, 'A Shocking Injury: A Clinical Review of Lightning Injuries Highlighting Pitfalls and a Treatment Protocol', *Injury*, 53 (2022), 3070–7, at 3073, 3075.

⁹³See e.g. Hawes, *Royal Humane Society ... 1803*, 64, 66.

⁹⁴H. J. ten Duis and H. J. Klasen, 'Keraunoparalysis, a "Specific" Lightning Injury', *Burns*, 12 (1985), 54–7; Powell *et al.*, 'Lightning Strike', *passim*, esp. 82, 92, 100; Van Ruler *et al.*, 'Shocking Injury', 3074; Cooray *et al.*, 'Lightning Caused Injuries', 391.

⁹⁵Crumplin, 'Surgery', 83–6.

⁹⁶'Medical and Surgical Journal of HMS *Abercrombie* (formerly the French ship *Le D'Hautpoul*) for 22 July 1809 to 30 March 1810 by William Eyre Odum, Surgeon', TNA, ADM 101/80/1B, fos. 1–6.

⁹⁷Cooray *et al.*, 'Lightning Caused Injuries', 389–90; Matthew E. Norman, Donavon Albertson and Brian R. Younge, 'Ophthalmic Manifestations of Lightning Strike', *Survey of Ophthalmology*, 46 (2001), 19–24, esp. 22–3; S. Cazabon and T. R. Dabbs, 'Lightning-Induced Cataract', *Eye*, 14 (2000), 903–6.

No two men suffered in exactly the same way, either. In addition to initial 'slight vertigo & dispnaea', Kerry's shipmate James Lucas, struck on the same occasion in April 1837, found himself with a paralysed eyelid, which caused him pain when lifted; the eye bulb was inflamed ('the entire conjunctiva evinced vascularity') and vision in the right eye was lost: after a fortnight, he began to recover some of it, but he remained severely short-sighted, and was eventually discharged from the service, as the injury was deemed likely to be permanent.⁹⁸ In October 1806, aboard HMS *Orpheus*, Samuel Gardiner and Michael Macklaughlin [*sic*] presented similar symptoms after being struck: Gardiner could not open his eyes, feeling 'extremely violent' pain, and when his eyelids were parted he was 'insensible to the strongest light'; Macklaughlin had lost both 'Sight and hearing'. Within three days, Gardiner had made a full recovery, and was soon discharged back to duty. Macklaughlin only 'recovered the sight of his right eye', but remained otherwise blind and deaf, and was invalidated.⁹⁹ The outcomes of lightning strikes were a terrible lottery. For surgeons trying to preserve their expert professional authoritativeness, dealing with a lottery was highly problematic. One can easily see how, like the soldier struck by lightning in 1797, whose military surgeon could make no sense whatsoever of the symptoms, a man might be 'left ... very little satisfied with what' his doctor 'had done for him' – and eventually even stop collaborating in full.¹⁰⁰

Lightning knowledges

A few surgeons appear to have had elements of pre-existing knowledge on lightning, despite the terseness of their manuals. Even when they came to the subject with some degree of preparation, however, the chaotic clinical presentation of electrocuted victims could defy their expectations. In June 1814, examining a fatality in HMS *Palma*, Thomas Alexander not only found 'not ... the slightest mark of external injury', but also none of the 'peculiar flacidity [*sic*], or laxity of the general system of muscles, as described to be the consequence of death by lightning'. The only possible 'peculiarity' was that the corpse underwent 'sudden cooling'. But the baffled and very busy surgeon was not even sure of that: 'I could suppose, for I do not speak "certainly"'. He unsuccessfully attempted 'inflating the lungs' and bleeding, but 'no blood was discharged'; by the morning, the whole upper portion of the body was black, and 'under some parts' of the skin 'blood was diffused'.¹⁰¹ What tools was the surgeon trying to use to interpret this casualty?

Flaccidity often accompanies the temporary numbness and keraunoparalysis experienced by some victims.¹⁰² Next to this fact, Alexander was possibly drawing his expectations, in an indirect way, from the work of the Italian natural philosopher Giambattista Beccaria, whose treatise *Dell'Elettricismo. Lettere* had been extensively discussed in Joseph Priestley's *The History and Present State of Electricity* (1767). Priestley

⁹⁸TNA, ADM 101/95/3B, fos. 15–17. On 'paralyses of the optic nerves' and 'incurable blindness' caused by lightning, see also Fothergill, *Preservative Plan*, 18.

⁹⁹'Journal of HMS *Orpheus* by William Maybank, Surgeon, for 29 October 1805 to 29 October 1806', TNA, ADM 101/111/3, fos. 11r–11v.

¹⁰⁰Paterson, 'Case of Gangrenous Stomach', 115, 117–19.

¹⁰¹TNA, ADM 101/112/1, fo. 12r.

¹⁰²See esp. Cooray *et al.*, 'Lightning Caused Injuries', 391.

reports the observation that a flow of electricity leaves behind a 'vacuum', together with Beccaria's theory (which does not convince him) that such a vacuum can instantly kill animals: 'a vacuum being only suddenly made near them, and the air immediately rushing out of their lungs to fill it, whereby they are left flaccid and empty'. Beccaria, however, was only referring to those casualties who had not been 'touched with the lightning': 'whereas when persons are properly killed by lightning, their lungs are found distended.'¹⁰³ Priestley also described a 'livid' corpse, akin to Alexander's patient, as a potential effect of lightning strokes, owing to 'burst' 'blood vessels'.¹⁰⁴ 'Very hard' cadavers, 'distended with air in the intestines' and left 'extremely livid', had been observed by others, too: for example, the priest and scholar of electricity John Lyon in a 1796 publication, where he analysed the bodies of a man and four horses killed by lightning just outside Dover.¹⁰⁵

On the whole, the naval surgeon's patient notes matched what was known about the clinical presentation of various types of victim of electrical discharges; yet, the extent to which he realised this remains unclear. He knew of 'flaccidity' as a standard symptom, but with no real notion of its causes or details of the debates that had surrounded it. As a result, he appeared to believe that it constituted a universal feature of lightning casualties. In 'inflating the lungs', too, he was simply applying a generic reanimation technique, also used for lightning victims ashore, but deemed especially appropriate for suffocation or drowning.¹⁰⁶ As it happens, modern emergency guidelines still indicate CPR for victims of lightning shock; the reason, however, is that strikes often induce paralysis of the medulla, a nervous connecting node that is responsible for respiratory and cardiovascular regulation.¹⁰⁷ Inflating the lungs *could* work, but the other techniques used against suffocation, like bleeding or cold water shocks, would most likely not.

In other respects, pertaining to the general behaviour of electricity, shipboard medics were even less prepared. In October 1799, when three men were struck in HMS

¹⁰³Joseph Priestley, *The History and Present State of Electricity, with Original Experiments* (1767; Cambridge and New York, 2013), 465–6, 638–9. A lethal vacuum, it was argued, could be created both by thunder and by cannonballs hurtling past: Stanhope, *Remarks*, 5–6. Modern medicine recognises multiple ways in which lightning can hurt people: through a direct strike, 'contact with another struck object', a side-flash from a close object, electricity coming from the ground, or the blast wave or other 'blunt trauma'. See e.g.: Cooray *et al.*, 'Lightning Caused Injuries', 387; Powell *et al.*, 'Lightning Strike', 99; Mills, 'Updated Assessment', 999.

¹⁰⁴Priestley, *History*, 98.

¹⁰⁵Lyon, *Account*, 14, 16.

¹⁰⁶The same phrase is used e.g. in [Fothergill], *Farther Hints*, 111. See also Fothergill, *Preservative Plan*, 15, and a 1745 essay by Anthony Fothergill's friend John Fothergill, reported in *Works of John Fothergill*, 147–51. On insufflation for resuscitation in the eighteenth century see Bamji, 'Blowing'; Václav Grubhoffer, 'Fear of Seeming Death in Eighteenth-Century Europe', in *Death in the Middle Ages and Early Modern Time: The Material and Spiritual Conditions of the Culture of Death*, ed. Albrecht Classen (Berlin and Boston, MA, 2016), 491–517, at 503–8.

¹⁰⁷Powell *et al.*, 'Lightning Strike', 98–100; Radostina Iordanova and Anil Kumar Reddy Reddivari, 'Neuroanatomy, Medulla Oblongata', *StatPearls [Internet]* (Treasure Island, FL, 2023), <https://www.ncbi.nlm.nih.gov/books/NBK551589/>; Mark M. Ravitch *et al.*, 'Lightning Stroke: Report of a Case with Recovery after Cardiac Massage and Prolonged Artificial Respiration', *The New England Journal of Medicine*, 264 (1961), 36–8.

Arab, surgeon Thomas Tappen, too, 'had recourse to those means used for the recovering life [sic] in cases of suffocation, but all to no use'.¹⁰⁸ Tappen had qualified as Navy surgeon two years before, in 1797: he was still relatively junior, but not altogether a new hand.¹⁰⁹ However, he also noted that 'the most astonishing of all, was that a man who was up at the main top G[allan]t mast head' when the main mast was hit 'remain'd untouch'd'.¹¹⁰ From a scientific point of view, this is not astonishing, and contemporary natural philosophers had already abundantly noticed and attempted to explain similar phenomena. Harris, a couple of decades later, used the apparently miraculous escapes of seamen even very close to the strike point to demonstrate that conducted lightning produced no 'lateral discharge'.¹¹¹ But already in the 1760s and 1770s, both Priestley and Charles Stanhope had remarked that lightning could miss people located in between others who were struck. Stanhope had observed this on large distances, attributing it to a 'returning stroke', whereas Priestley related the 'story of the five peasants of whom the first, third, and fifth were killed by lightning, as they were walking in a right line': he used it in support of his theory that electricity flowed in concentric circles.¹¹² These explanatory models may not have been correct, but they were available – to anyone with knowledge of the field. Simply, surgeons did not always have the full theoretical training in natural philosophy that would have allowed them to make sense of some of the phenomena with which they were faced. As such, they ended up partaking in at least some of the bewilderment of their crew.

Even had these medical men possessed the most thorough and confident knowledge of electrophysics, anyway, the sailors' own feelings and beliefs could be overpowering. Contrary to popular images of 'Jack Tars' as godless and faithless, religious sentiment of various denominations occupied a profound space in their lives.¹¹³ While traditional organised religion did not always convince them, seafarers laid important store by omens and other types of credence.¹¹⁴ Observations of electrical phenomena prompted some of the most ubiquitous manifestations of such belief systems: the meteor variously known as 'comazant', '*corpo santo*', or 'St Elmo's Fire', appearing as a faint electrostatic glow above the masts, was widely taken to signal the approach or the end of a storm, depending on its behaviour and whether it was single or multiple.¹¹⁵ More generally, storms elicited strong passions towards the divine, in one sense or another. In his memoirs, the deeply religious ex-naval sailor Samuel Leech reports an extract from his journal, written during a transatlantic voyage aboard a packet-ship in June 1841: 'The lightning is very sharp', he noted down at 2 p.m.; 'We expected it

¹⁰⁸'Journal of HMS *Arab* for 27 March 1799 and 27 March 1800 by Thomas Tappen, Surgeon', TNA, ADM 101/85/4A, fo. 17r.

¹⁰⁹Turnbull, *Naval Surgeon*, 399.

¹¹⁰TNA, ADM 101/85/4A, fo. 17r.

¹¹¹Harris, 'On the Course', 410–12.

¹¹²Mahon, *Principles*, 115–16; Priestley, *History*, 670.

¹¹³Christopher P. Magra, 'Faith at Sea: Exploring Maritime Religiosity in the Eighteenth Century', *International Journal of Maritime History*, 19 (2007), 87–106; Alain Cabantous, *Le ciel dans la mer: Christianisme et civilisation maritime, XVI^e–XIX^e siècles* (Paris, 1990).

¹¹⁴Marcus Rediker, *Between the Devil and the Deep Blue Sea: Merchant Seamen, Pirates, and the Anglo-American Maritime World, 1700–1750* (Cambridge, 1987), 169–86.

¹¹⁵Beck, *Folklore*, 92–4; Anon., 'Naval Improvements', 351–2; Harris, *On the Nature*, 19–21; Rediker, *Between the Devil*, 181–2.

would strike us every moment but a kind Providence protected us'.¹¹⁶ Twenty-seven years before, as a prisoner of war, he and some of his comrades used to 'confess', to a minister 'and to each other', 'how often we had sinned, even cursing our Maker when on the yard at night, amid the roaring of the storm, the bellowing of the thunder, and the angry flashing of the lightning'.¹¹⁷ Most of all, sudden, arbitrary, miraculous survival or horrifying death both left a deep impression on the men. While writing one of his studies, Harris met up with a seaman from the *Buzzard* brig, Robert Purk: in February 1838, lightning had passed so close to him that it had torn 'a strip out of ... [his] shirt about two inches wide from the shoulder to the wrist without hurting him'. Purk, Harris writes, 'very kindly showed me the shirt, and pointed out the place where he was standing'.¹¹⁸ The sailor collaborated with the scientist trying to arrive at a natural truth, but between the lines we also distinguish the astonished survivor, who had kept his shirt as a personal relic and acquired an incredible tale – colourfully recounted to anyone prepared to listen.

When HMS *Arab* was hit in 1799, and Thomas Tappen attempted to treat the victims as if they had been suffocated, he was operating in the aftermath of a highly shocking event, whose description echoes those of many others that we have encountered so far:

our Main Top Mast was splinter'd to pieces, every Man on Deck knock'd down, (many of whom cried out their Legs or Arms were broke) from the Violence of the Shock; the Broke Bolt, broke, as it left the Main mast, which acted as it's [*sic*] conductor, and issued a most Sulphureous stench accompanied with three sharp cracks¹¹⁹

The 'violent Squall of Rain and Wind' that had been raging suddenly abated, '& in an instant [there was] not a breath of air out of the heavens'. To Tappen, the three struck 'Patients were bonafide dead'. However, while one of them presented clear burns on one side ('tho the Shirt remain'd entire'), 'the Two others, had no other appearance than of Contusion jest [*sic*] under the Ear & about the Forehead'. These undisturbed, largely unmarked bodies caused consternation among their old shipmates, and for a while the surgeon was even prevented from burying them. 'We kept them till Evening,' notes Tappen, 'to satisfy the credulity & superstition of Sailors, when their bodies were committed to the deep'.¹²⁰ The terror of 'seeming death' and a 'premature burial' haunted the popular – and even professional – imagination in the eighteenth and nineteenth centuries.¹²¹ At sea, it contributed to specific practices, such as that of passing a final 'stitch through the nose' when sewing up corpses into their shrouds.¹²² A scared,

¹¹⁶Leech, *Thirty Years*, 289–90.

¹¹⁷*Ibid.*, 214.

¹¹⁸Harris, 'On the Course', 411.

¹¹⁹TNA, ADM 101/85/4A, fo. 17r.

¹²⁰*Ibid.* Again, 'no external appearance denoting a mortal wound' had been observed in lightning fatalities ashore: Lyon, *Account*, 14.

¹²¹See e.g. Grubhoffer, 'Fear'; Bamji, 'Blowing', 52–3.

¹²²David J. Stewart, 'Burial at Sea: Separating and Placing the Dead During the Age of Sail', *Mortality*, 10 (2005), 276–85, at 280–1.

dismayed, profoundly impressed crew posed significant challenges for a naval officer; the delicate power dynamics aboard could be uniquely upset by moments of shock and crisis, where various forms of knowledge and beliefs competed to make sense of what had happened. Themselves surprised and perhaps slightly shaken, and fundamentally impotent in the face of devastating bodily injuries, surgeons could be forced to give seamen's own convictions some space to breathe. In this case, quite interestingly, the sailors' intuition may well have been correct: as we saw above, 'dead' victims of lightning are different from other clinically dead people, and can often be brought back. The emotional and experiential knowledge behind what Tappen dismissed as 'credulity & superstition', then, remains an open question, taunting the historian as much as it challenged the surgeon.

On a higher level, the microdynamics of shipboard cultures could ultimately affect operational matters in the fleet at large. In HMS *Theseus*, in 1803, during a thunderstorm just off Saint Domingue, 'the people rushed up the hatchways, and were with difficulty prevented from jumping into the sea' – probably because lightning had sparked a fire aboard; in fact, while heavily damaged, the ship ultimately survived, with only one victim.¹²³ The reaction had been justifiable, but, from the point of view of the Navy, dangerous. Unsurprisingly, the effects of a lightning strike among the crew also endured well beyond the moment of crisis. In 1799, HMS *Cambrian* was severely hit, with over twenty casualties; an officer reported that 'for many months' afterwards 'the men' could not 'get rid of the impression produced on them, whenever the atmosphere seemed charged with the electric fluid'.¹²⁴ A very similar phenomenon was noticed by an officer of HMS *Repulse*, in 1810: after a strike left eleven dead and ten hurt, 'a great alarm prevailed amongst the seamen for some time after, whenever lightning presented itself'.¹²⁵ In the Mediterranean, in the latter part of the Napoleonic Wars, 'the effects of lightning' were 'so dreaded' that apparently the Commander-in-Chief ordered 'that the men were not to be sent aloft during the prevalence of lightning, except in cases of great emergency'.¹²⁶ In the 1762 edition of his essay, James Lind, persuaded that wet clothes would protect sailors from lightning, advised officers to get them busy under the rain, or 'If this cannot be complied with, let some Artifice be fallen upon, that at least the Hats of all the Men in the Watch be dipped in Water. This may be effected in way of Play, or Diversion, among the People, without their knowing the Reason of it'.¹²⁷ Such was the danger of spreading panic aboard, or encountering resistance, that officers were told to deploy underhanded (and rather patronising) management tactics with their seamen. For people used to weather storms and gunfire, vertiginous heights and horrifying disease, lightning strikes seemingly remained a substantial, perhaps unique, source of collective trauma. This sets them aside as particularly vivid moments, during which the structure of naval life was deeply shaken.

¹²³[William] Snow Harris, *State of the Question Relating to the Protection of the British Navy from Lightning ...* (Plymouth, 1838), 9; Harris, *Remarkable Instances*, 55.

¹²⁴Quoted in Harris, *State*, 9. See also Harris, *Remarkable Instances*, 42.

¹²⁵Harris, *State*, 9; Harris, *Remarkable Instances*, 51.

¹²⁶Harris, *State*, 9.

¹²⁷Lind, *Essay* (1762), 43.

Conclusion

The fact that lightning injuries were sidelined in surgeons' training, and survivals still frequently dismissed as miraculous, could result in episodes of epistemological and social crisis, during which seamen's 'superstition' and embodied knowledge became difficult to challenge with alternative, authoritative paradigms. There are several points that we can take away from this. First, my aim here was simply to restore lightning, in all its variety and concrete effects, to our overly 'blue' picture of naval service. Paying attention to every dimension of the marine environment, and its exact interactions with the human organism, remains essential especially for historians who aim to recover seamen's embodied experiences. We should never forget to look up, as well as down.

Second, studying lightning injuries confirms that health and bodies are a crucial site where shipboard hierarchies could be tested. Eighteenth- and nineteenth-century surgeons lost many patients, to all sorts of wounds or disease. Yet, when it came to this type of casualty, they seem to have been even more impotent than normal in determining death or recovery, because of the absence of solid guidelines – or in fact debate. This undermined the medical officers' role as leading custodians of therapeutic knowledge aboard. It also potentially upset discipline and obedience more broadly, as the fear of sudden, uncontrollable, and perhaps incurable injury paralysed the men and left behind enduring psychological trauma. If battles could be survived through adrenaline, strenuous activity, or patriotic arousal, a lightning bolt out of the sky was possibly more difficult to confront, or to rationalise.

This material, however, also raises a third, more general methodological point. The presentation of lightning injuries remains a somewhat thorny problem in emergency medicine today. The rarity of reported incidents tends to prevent systematic study, making for patchy literature and treatment guidelines.¹²⁸ This is reflected in the personal preparedness of responders. For example, a training simulation held with a group of American resident doctors in 2021 found that 'several learners struggled with identifying Lichtenberg figures and keraunoparalysis either due to the low-light setting, unfamiliarity of the pathology, or that the depictions were not as expected'.¹²⁹ These are factors that we readily recognise from our shipboard examples. The authors of the 2021 study also hypothesised that this type of emergency appeared 'challenging' because it was 'low-frequency' 'and the residents had minimal prior clinical exposure to this injury'.¹³⁰ The sources that we have discussed in this article, then, illustrate the trans-historical fruitfulness of looking at uncommon but devastating types of injury, for historians and sociologists interested in medical authority and in the doctor-patient relationship. Lightning, I would argue, serves this purpose especially well, due to its long-standing religious symbolism, and its inflicting of particularly abrupt, sensorially loaded types of death and harm, bordering on the inexplicable and recalling the divine.

¹²⁸ Van Ruler *et al.*, 'Shocking Injury', 3071.

¹²⁹ Powell *et al.*, 'Lightning Strike', 79.

¹³⁰ *Ibid.*, 80.

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