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Science on the Niger: ventilation and tropical disease during the 1841 Niger Expedition.

This article explores the relationship between technology, disease, and imperialism in the mid-nineteenth century.[1] To understand how this relationship was played out in terms of the medical and mechanical solutions to tropical disease, we should not confine our historical investigation to technologies that in hindsight are celebrated as successes. Nowhere was this more apparent, than on the British expedition to the River Niger in 1841. Facing the immense challenge of tropical disease, this endeavour marked the high point of a period in which humanitarian considerations, including a moral urgency to extinguish African slavery, shaped British colonial policy.[2] To overcome the perceived disease-ridden airs of the Niger basin, the three iron steam-ships which comprised the expedition were each equipped with an elaborate system of ventilation apparatus with which to purify their atmospheres. Although on the face of it, these systems of on-board ventilation, which the Edinburgh chemist David Boswell Reid designed and implemented, did not prevent the spread of disease, the role this technology played in the expedition was extensive. The question of how Reid's ventilation had performed was highly political and was conscripted within contrasting programmes in favour of, and opposed to, future intervention in West Africa. While the expedition's promoters believed Britain had an obligation to take action against the Niger's slave trade, detractors argued that such territories should be left alone and remain the domain of private commercial interest. Within these debates was a concern over whether Britain was even able to adopt a more active colonial policy

[1] Rather than technology, contemporaries would have understood Reid's ventilation as a work of applied science, however the term 'technology' is employed in order to engage with histories of technology and imperialism, see Ben Marsden and Crosbie Smith, *Engineering Empires: a cultural history of technology in nineteenth-century Britain*, (Basingstoke: Palgrave Macmillan, 2005), 3; Graeme Gooday, '"Vague and Artificial": the historically elusive distinction between pure and applied science', *Isis*, 103:3, September, 2012, 546-554; on technology and imperialism, see Philip D. Curtin, *Disease and Empire: the health of European troops in the conquest of Africa*, (Cambridge: Cambridge University Press, 1998), ix-x and 230; Zaheer Baber, *The Science of Empire: scientific knowledge, civilization, and colonial rule in India*, (New York: State University of New York Press, 1996); on medicine and imperialism, see Douglas M. Haynes, *Imperial Medicine: Patrick Manson and the conquest of tropical disease*, (Philadelphia: University of Pennsylvania Press, 2001).

[2] Ronald Hyam, *Britain's Imperial Century, 1815-1914: a study of empire*, (Basingstoke: Palgrave Macmillan, 2002), 83; Philip D. Curtin, *The Image of Africa: British ideas and action, 1780-1850*, (London: Macmillan, 1965), 290.

in Africa; worryingly about 77% of white soldiers stationed in West Africa during the 1820s perished, while a further 21% became invalids.[3] In this context, the expedition steamships became important spaces through which protagonists could promote varying agendas for future British activity in West Africa.

Nevertheless, the expedition was a complete disaster, which failed in its aims to promote commerce, Christianity, and the abolition of the river's slave trade. This failure was largely due to the outbreak of fever among the crew which forced the expedition's termination; air-purification technology did little to prevent the spread of disease. To focus on a failure such as the Niger expedition undermines traditional triumphalist narratives of nineteenth-century European expansion in Africa.[4] This is especially pertinent when examining the use of medical knowledge in African exploration. Attention to an apparent technological failure challenges historical accounts which seek to portray technology as a determining force in the process of nineteenth-century imperialism. In *The Tools of Empire* (1981) and *Power Over Peoples* (2010) Daniel Headrick has described 'key technologies', such as steamships and the prophylactic use of quinine, as having an inherent power in driving European expansion.[5] He explained how 'advances in three areas of technology – steamboats, medicine, and weapons – gave Western nations new powers over nature', thus providing 'empire-builders with powers over non-Western peoples'.[6] In Headrick's analysis, the only technologies

[3] Hyam, *Britain's Imperial Century*, 19-20; Daniel R. Headrick, *The Tools of Empire: technology and European imperialism in the nineteenth century*, (Oxford: Oxford University Press, 1981), 62-63.

[4] Focusing on the failed 1816 Congo and 1841 Niger expeditions, see Dane Kennedy, 'Forgotten Failures of African Exploration', [https://publicdomainreview.org/2015/04/22/forgotten-failures-of-african-exploration/, accessed 18 Sept 2016].

[5] Headrick, *The Tools of Empire*, 12; Daniel R. Headrick, *Power Over Peoples: technology, environments, and Western imperialism, 1400 to the present*, (Princeton: Princeton University Press, 2010), 2.

[6] Headrick, *Power Over Peoples*, 177; on technological determinism, see Merritt Roe Smith and Leo Marx, eds, *Does Technology Drive History? The dilemma of technological determinism*, (Cambridge, Massachusetts: MIT Press, 1994); also see Michael W. Doyle, *Empires*, (Ithaca: Cornell University Press, 1986), 182; Douglas M. Peers, 'Revolutions, Evolution, or Devolution: the military and the making of Colonial India', in Wayne E. Lee, *Empires and Indigenes: intercultural alliance, imperial expansion, and warfare in the early Modern world*, (New York: New York University Press, 2011), 81-106, 94.

worthy of attention are those which, in hindsight, were successful; or in other words, those that had material impact. For example, he argued that tropical disease prevented imperial exploration in West Africa, but that the discovery and use of quinine as an effective preventative to malaria opened the continent up for conquest. As Headrick put it, before 'Europeans could break into the African interior successfully, they required … a triumph over disease'.[7] This deterministic 'model of causality' describing the relationship between technology and imperialism is contingent on the combination of economic motives with technological means; once both were in place imperialism followed, seemingly regardless of the often troubled nature of new technological works.[8] Focusing on a technology that materially had no determining power forces us to develop Headrick's interpretation; he is right to draw our attention to the importance of technology, but we need a more nuanced analysis.

Instead of assessing a technology's impact on imperialism in terms of how well it prevented disease or aided travel, we should look to see the shaping role such technologies had on social, political, and cultural understandings of exploration and expansion. Reid's work did not protect the expedition's crews from malaria or yellow fever, but it did provide a valuable framework through which promoters of African exploration could assert that their ambitions might be realized. This analysis therefore builds on Marsden and Smith's *Engineering Empires* which provides an alternate cultural history of technology and imperialism. They analyse technologies, such as telegraphy and railways, in their varying social contexts. As they put it, 'Whether or not a technology succeeds or fails, is as much to do with the social, as it is to do with any supposed inherent material worth'.[9] Ocean steamships, for example, were 'mobile' sites which carried 'to far-flung places the authority of their builders, the prestige of their owners, and the ambitions of their nation'. They were moving

[7] Headrick, *The Tools of Empire*, 59.

[8] Ibid., 9-10.

[9] Ben Marsden and Crosbie Smith, *Engineering Empires: a cultural history of technology in nineteenth-century Britain*, (Basingstoke: Palgrave Macmillan, 2005), 1-2 and 6.

'embodiments of the knowledge, skills, and practices of shipbuilders and marine engineers'.[10] My article elaborates on this notion that the prominence of nineteenth-century technologies was about their social, rather than purely material, value. As Marsden and Smith assert, technologies were rarely portrayed crudely as either successes or failures, but promoters instead attached more ideological representations to such works.[11] The character ascribed to a technology cannot be separated from its political context, and in the case of the Niger expedition steamships this entailed serious concerns over Britain's role in West Africa.[12] In past histories of imperial expansion and medicine, the Niger expedition appears significant not for the use of ventilation apparatus, but because of Dr Thomas Thomson's use of cinchona bark, from which quinine could be extracted to treat malaria.[13] Unlike quinine, in hindsight, air-purification appears a failed technology which did not prevent disease which was not carried by bad air. Yet because Thomson did not make his tentative observations regarding

[10] Crosbie Smith, '"The 'Crinoline' of Our Steam Engineers": Reinventing the Marine Compound Engine, 1850-1885', in David N. Livingstone and Charles W. J. Withers, eds, *Geographies of Nineteenth-Century Science*, (Chicago: University of Chicago Press, 2011), 229-254, 230-231; also see Crosbie Smith, Ian Higginson and Phillip Wolstenholme, '"Avoiding Equally Extravagance and Parsimony": The Moral Economy of the Ocean Steamship', *Technology and Culture*, 44:3, July, 2003, 443-69.

[11] Marsden and Smith, *Engineering Empires*, 6; on the importance of public opinion on the course of territorial expansion, see John Darwin, 'Imperialism and the Victorians: the dynamics of territorial expansion', *English Historical Review*, 112: 447, June, 1997, 614-642, 622 and 641; for a discussion over notions of technological 'success' and 'failure', see Ben Marsden, 'Blowing Hot and Cold: reports and retorts on the status of the air-engine as success or failure, 1830-1855', *History of Science*, 36:4, 1998, 373-420.

[12] On the political significance of narratives of tropical disease, see Jessica Howell, *Exploring Victorian travel literature: disease, race, and climate*, (Edinburgh: Edinburgh University Press, 2014), 52 and 56; on the slave trade's shaping of geographical knowledge, see David Lambert, *Mastering the Niger: James MacQueen's African Geography and the Struggle over Atlantic Slavery*, (Chicago: University of Chicago Press, 2013), 4-5; on the relationship between science and exploration, see Robert A. Stafford, *Scientist of Empire: Sir Roderick Murchison, scientific exploration and Victorian imperialism*, (Cambridge: Cambridge University Press, 1989), esp 168.

[13] Headrick, *The Tools of Empire*, 66 and 68.

the efficaciousness of quinine until 1846, in the expedition's wake it was ventilation which was subject to conjecture.[14]

To begin with, I examine the political context of the expedition. The operation was initially a private undertaking, launched against the slave trade. When Lord Melbourne's Whig government adopted it as part its colonial policy, it subsequently came to represent wider questions over British expansion. It became a focal point for those opposed to state interference in West Africa. I then look at the government's adoption of ventilation apparatus to secure the health of the expedition's crew. Rather than refer to this mechanical scheme as 'technology', Reid's work was understood as an application of chemical science.[15] Detractors were quick to point out that because of the Niger's climate and the risks of tropical disease, the whole expedition was doomed. The expedition's promoters set their hopes on constructing the three steamships as floating ventilation systems, purifying the air the crews consumed. Finally, I look at how readings of the ventilation's performance fit in wider accounts of the expedition. In the 1840s, air-purification appeared both a promising medical breakthrough and a colossal failure, yet both of these evaluations were deeply political. As protagonists rushed to draw lessons from the expedition, they sought testimonies and witness accounts of the ventilation's performance. As will be shown, the use of testimony and eye-witness reports from the Niger was crucial to investing credibility into Reid's works in the fall out of the expedition. While critics back home in Britain sought to discredit Reid's apparatus, promoters of the expedition

[14] Thomas R. H. Thomson, 'On the value of Quinine in African Remittent Fever', *The Lancet*, 28 February, 1846, I, 244-5; histories of Reid's ventilation schemes often brush aside his work as little more than a novelty which lacked serious scientific credentials, for example, see Caroline Shenton, *Mr Barry's War: rebuilding the Houses of Parliament after the great fire of 1834*, (Oxford: Oxford University Press, 2016), 166.

[15] Whether Reid performed science or not was itself a serious question in the 1830s and 1840s, see Edward J. Gillin, 'The Science of Parliament: building the Palace of Westminster, 1834-1860', (Unpublished DPhil thesis, University of Oxford, 2015), 117-178.

conscripted testimonials to validate ventilation as a practical solution to tropical disease which might open up the continent to British intervention.[16]

Moral ambitions and medical fears

On 1 June 1840 the London philanthropic bastion of Exeter Hall was the scene of a dramatic gathering. Before a crowd of over 5,000, Prince Albert chaired the founding meeting of the Society for the Extinction of the Slave Trade and for the Civilization of Africa (ACS), of which he was President.[17] Thomas Fowell Buxton (1786-1845), politician, philanthropist, and William Wilberforce's anti-slavery partner, had established the society in 1839 with a mandate to diffuse Christianity throughout Africa. Although an Anglican, Buxton was part of a firm Quaker network which included his sister-in-law, the prison reformer Elizabeth Fry (1780-1845). To an excited audience the ACS announced an expedition of three steamships to the Niger River, and simultaneously launched a journal to publicize the zealous work of the mission. This publication, the *Friend of Africa*, declared the society to be unanimously committed to 'open competition, and free trade, in its largest and most liberal sense'.[18] The expedition was intended to eradicate ignorance and slavery from Africa.[19] The journal subsequently appealed to a wide Christian audience and avoided distinguishing between specific Anglican and non-established dissenting values. Rather, it promoted the expedition as a broad British Christian effort. The Exeter Hall audience included a host of Roman

[16] Dane Kennedy, *The Last Blank Spaces: exploring Africa and Australia*, (Cambridge, Massachusetts: Harvard University Press, 2013), 51 and 57.

[17] (Anon.), 'Origin of the Society', *Friend of Africa*, 1 January, 1841, 1:1, 5; for context, see David Richardson, Suzanne Schwarz, and Anthony Tibbles, eds, *Liverpool and Transatlantic Slavery*, (Liverpool: Liverpool University Press, 2007); on Exeter Hall, see Felix Driver, *Geography Militant: Cultures of Exploration and Empire*, (Oxford: John Wiley & Sons, 2001), 75-6.

[18] (Anon.), 'Address on Behalf of Africa', *Friend of Africa*, 1 January, 1841, 1:1, 3; also see Charles Buxton, *Memoirs of Sir Thomas Fowell Buxton, Baronet*, (London: John Murray, 1848), 514-551.

[19] Howard Temperley, *White Dreams, Black Africa: the antislavery expedition to the River Niger, 1841-1842*, (New Haven: Yale University Press, 1991), 12-13.

Catholic clergy, several prominent Quakers, and nine Anglican bishops. The ACS proclaimed that the tool with which their civilizing mission would be accomplished was science, which was 'Christian Knowledge'. As the *Friend of Africa* explained, one of the 'most powerful obstacles to the diffusion of Christianity and Science' was the high levels of disease encountered in Africa's tropical regions.[20] The journal informed readers that in Africa, medical science did not exist and tropical disease was surrounded by 'barbarous superstitions'.[21]

The ACS mobilized extensive support for its anti-slavery objectives and attracted government interest. Buxton, along with fellow abolitionist and lawyer George Stephen (1794-1879), secured the ACS government support.[22] They pointed out that the Royal Navy was failing to fulfil its role in curtailing the West African slave trade and that further measures were required.[23] Thanks largely to the Secretary of State for War and the Colonies, John Russell (1792-1878), the Whig government adopted the expedition as part of its colonial policy. During his tenure at the Colonial Office between 1839 and 1841, Russell pursued an imperial mandate shaped by moral considerations.[24] The Office's Permanent Under-Secretary and brother of George Stephen, James Stephen (1789-1859), was committed to anti-slavery measures, which found favour with Russell. Together they ensured that

[20] (Anon.), 'Prospectus', *Friend of Africa*, 1 January, 1841, 1:1, 8.

[21] Stewart J. Brown, *Providence and Empire: religion, politics and society in the United Kingdom, 1815-1914*, (Harlow: Routledge, 2008), 141-142.

[22] Olwyn Mary Blouet, 'Buxton, Sir Thomas Fowell, first baronet (1786–1845)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn, May 2010 [http://ezproxy-prd.bodleian.ox.ac.uk:2167/view/article/4247, accessed 17 Sept 2016]; Leslie Stephen, 'Stephen, Sir George (1794–1879)', rev. Peter Balmford, *Oxford Dictionary of National Biography*, Oxford University Press, 2004 [http://ezproxy-prd.bodleian.ox.ac.uk:2167/view/article/26371, accessed 17 Sept 2016]; also see J. Gallagher, 'Fowell Buxton and the New African Policy, 1838-1842.', *Cambridge Historical Journal*, 10:1, 1950, 36-58; for Buxton and West Africa, see Kristin Mann, *Slavery and the Birth of an African City*, (Bloomington: Indiana University Press, 2007), 87-90.

[23] Curtin, *Disease and Africa*, 19.

[24] John Prest, 'Russell, John [*formerly* Lord John Russell], first Earl Russell (1792–1878)',*Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn, May 2009 [http://www.oxforddnb.com/view/article/24325, accessed 15 Oct 2015].

humanitarian values shaped British colonial affairs.[25] When presented with a petition from Buxton, which included over 1.5 million signatures, calling for an end to West African slavery, Russell could not fail to see that he had a moral imperative to act.[26] He was sure that the government should establish commercial relations with African chiefs, beginning with the despatch of three steamships to the Niger.[27] Russell feared that if the expedition did not establish settlements on the river, either the French, Portuguese, or Texans would seize the Niger to facilitate their slave trades. He therefore issued the expedition's officers with draft agreements which could be filled in during trade negotiations with the Niger's chiefs and requested they purchase land if the opportunity arose. They were to establish a settlement in an area considered healthy and defendable.[28]

By the late 1830s the Whig government was short of ideas and rapidly losing ground to Robert Peel's (1788-1850) Conservative opposition. [29] The expedition represented a chance to recapture some popularity in a way consistent with wider Whig policies on free trade and commercial expansion. The Foreign Secretary, Lord Palmerston (1784-1865), was keen to open up new export markets in China, the Indus, and Arabia, while the Whig government was eager to be seen as committed to the principle of free trade, especially with escalating domestic bread prices following bad harvests in 1837 and 1838.[30] Along with abolishing slavery, both the Colonial Office and the ACS were desirous of 'rending the Expedition as complete in a scientific point of view as lay in their power'. Combining liberal economic values with Christianity and science, the venture would open

[25] Curtin, *The Image of Africa*, 290.

[26] Hyam, *Britain's Imperial Century*, 80.

[27] Parliamentary Papers (PP) 57 (1840), *Niger Expedition*, 2; also see Rhodes House, Bodleian Library Oxford (RHL), 100.221 r.214, 'Prospectus of the Society for the Extinction of the Slave Trade, and for the Civilization of Africa' (c.1839-1840), 3.

[28] PP. 472 (1843), 14-18.

[29] Ian Newbould, 'Whiggery and the dilemma of reform: liberals, radicals, and the Melbourne Administration, 1835-39', *Historical Research*, 128:53, 1980, 229-241, 231.

[30] Parry, *The Rise and Fall*, p. 144.

Africa 'to the missionary, the merchant, and the man of science'.[31] The expedition secured the support of the Royal Society which provided instruments for measuring the earth's magnetism during the voyage.[32] As the Royal Navy had no suitable vessels, the *Albert* and *Wilberforce*, each of 136 feet length with twin 35 horse-power steam-engines, and the *Soudan*, of 113 feet and a single 35 horse-power engine, were all specially built.[33] **(Figure 1)** Captain Henry Dundas Trotter (1802-59) of the *Albert* was to lead the expedition, with officers William Allen and Bird Allen commanding the *Wilberforce* and *Soudan*.[34] John Laird (1805-1874) of Birkenhead built the vessels which would carry a 'body of scientific men' including a botanist, a geologist, a naturalist, and a mineralogist.[35] Despite the government's financial difficulties, the Treasury bore the costs of building and maintaining the three ships, which by 1842 totalled £82,054.[36]

[31] (Anon.), 'Niger Expedition.', *Friend of Africa*, 1 January, 1841, 1:1, 10 and 12.

[32] Edward Sabine, 'Instructions for Magnetic Observations in Africa', *Friend of Africa*, 25 February, 1841, 1:4, 55.

[33] James Ormiston M'William, *Medical History of the Expedition to the Niger During the years 1841-2 comprising an account of the fever which led to its abrupt termination*, (London: J. Churchill, 1843), 2; Temperley, *White Dreams*, 67.

[34] PP. 472 (1843), *Papers Relative to the Expedition to the River Niger*, 83.

[35] (Anon.), 'Niger Expedition', *Friend of Africa*, 1 January, 1841, 1:1, 10.

[36] Public expenditure increased to £53.2 million by 1841, with a deficit for five consecutive years from 1838, see Jonathan Parry, *The Rise and Fall of Liberal Government in Victorian Britain*, (New Haven: Yale University Press, 1993), 141; PP. 494 (1842), *Niger Expedition*.

Figure 1: Embodying notions of scientific progress, the *Albert*, with the *Soudan* on the left and the *Wilberforce* on the right, off the coast of Holyhead in 1841. (Reproduced by permission of the National Maritime Museum, Greenwich, PAH0907)

While the expedition secured the support of Melbourne's administration, it aroused a great deal of scepticism in wider circles; particularly with those opposed to colonial expansion. With Conservative sympathies and a circulation of over 60,000, *The Times* was appalled by the Whig government's use of public funds to support a project it perceived to have little chance of success.[37] *The Times* feared the government's support was part of a shabby bid to capture political popularity at the expense of Peel's Conservative opposition. Robert Jamieson (1791/2-1861), a Liverpool merchant with a vested interest in keeping the government-financed expedition away from his commercial operations in West Africa, launched a sustained campaign through *The Times* against the

[37] Temperley, *White Dreams*, 60 and 137-138.

expedition.[38] Jamieson believed such a government backed project was contrary to all liberal concepts of free trade and threatened private enterprise. On the Niger, as in all other regions, Jamieson argued that 'commerce flourished best under competition of individuals'.[39] He did not trust the assurances of Russell that the expedition was free of commercial interest and believed Buxton was scheming to establish a trade monopoly in the tropics.[40] Rather than pursue a policy of expansion, he warned the government to keep away and let free trade flourish.[41]

George Stephen responded to Jamieson, defending Russell's support as 'the noblest act of … Colonial administration'. He accused Jamieson of wanting to protect his own trade monopoly on the Niger, identifying him as one of only six London and Liverpool merchants to be trading in the region.[42] Rather than damaging free trade, Stephen argued that the expedition would end this monopoly and open the continent up to competition. He confessed that Russell's actions would probably lead to the colonization of the Niger, noting that where 'we found settlements in Africa, colonization must follow', but maintained that this meant education, protection, and instruction 'in the construction of machinery' for the Niger's people.[43] These debates continued in Parliament, where Russell faced hostilities from radicals and Conservatives alike. This was despite Peel attending the ACS's founding meeting in Exeter Hall. The radical Utilitarian MP and doctor, Joseph Hume (1777-

[38] James Tait, 'Jamieson, Robert (1791/2–1861)', rev. Elizabeth Baigent, *Oxford Dictionary of National Biography*, Oxford University Press, 2004 [http://www.oxforddnb.com/view/article/14642, accessed 28 April 2014].

[39] Robert Jamieson, 'A further appeal to the government and people of Great Britain against the proposed Niger Expedition', *The Times*, 12 February, 1841, 6; Issue 17592; also argued in Robert Jamieson, *An appeal to the Government and People of Great Britain, against the proposed Niger Expedition: a letter, addressed to the Right Hon. Lord John Russell*, (London: Smith, Elder, and Co, 1840), ii.

[40] Robert Jamieson, *A further appeal to the government and people of Great Britain, against the proposed Niger expedition*, (London: Smith, Elder, and Co, 1841), 12-13.

[41] Ibid., 15; also see (Anon.), *Outline of a vocabulary of a few of the principal languages of Western and Central Africa; compiled for the use of the Niger Expedition*, (London: John W. Parker, 1841).

[42] George Stephen, *A letter to the Rt. Hon. Lord John Russell, in reply to Mr. Jamieson, on the Niger Expedition*, (London: Saunders and Otley, 1840), 3 and 10.

[43] Ibid., 28-30.

1855), raised concerns over the expedition's objectives, fearing it was an act of aggressive colonization, rather than discovery.[44] At the same time, the Conservative MP for Staffordshire South, Lord Ingestre (1803-68), doubted the prudence and practicability of the scheme. While concerns over free trade and colonial expansion dominated these debates, much opposition centred on the risks of disease. Ingestre warned that, quite aside from any political party interests, he feared for the lives of the expedition's crews. The river's miasmas sustained high death rates, and it was misguided for the government to finance an expedition to carry out the ACS's zealous ambitions if it endangered the lives of British subjects.[45] Jamieson himself seized on this question of disease, warning that 'suffering and almost certain destruction' awaited the crews employed to carry out the ACS's 'theoretical scheme'.[46]

The problem of disease created dilemmas over the ability of the British government to pursue its moralistic policies. Regardless of whether increasing Britain's influence in West Africa was desirable or not, these concerns made it doubtful that Russell would be able to project the will of the Colonial Office to the banks of the Niger. Yet the role of disease in these debates was actually about much more than showing Britain's inability to exert influence in West Africa. Given its public support, evident at the Exeter Hall meeting, it seems clear that the expedition was a sensitive subject. For merchants such as Jamieson and journals such as *The Times* to oppose an operation with such strong anti-slavery credentials could be politically risky, however the problem of disease provided what seemed like a genuine practical concern. While arguments based on commercial interest could easily be foiled on the moral grounds of ending West African slavery, the questions of disease warranted an immediate solution. The *Friend of Africa* published Professor John Frederic Daniell's (1790-1845) detailed reports of experiments made on water samples taken from previous expeditions to rivers along the West African coast, proving that the impregnation of the atmosphere with poisonous gas, originating from decaying vegetable matter, caused disease. Daniell believed that such

[44] House of Commons debate, 16 February, 1841, *Hansard*, 3rd Series, 56, 696.

[45] Ibid., 694-695.

[46] Jamieson, *A further appeal*, 18.

firm knowledge of the miasmic cause of disease should instil confidence into the expedition.[47] Daniell also provided a memorandum on how to combat such dangerous miasmas by chemically purifying the air which entered the three steamships.[48] The ACS was confident that medical science could overcome 'the fatal barrier of miasma' encircling the coasts of West Africa.[49] Both the ACS and the government believed they had a practical and scientific answer to the problem of disease.

Reid's ventilation

The solution to the perceived problem of Africa's miasmas, the ACS believed, was to be found in the work of the chemist, David Boswell Reid (1805-1863). Reid had secured fame for his construction of a ventilation system in the temporary House of Commons, in use following the 1834 fire which destroyed the medieval Palace of Westminster. Born in Edinburgh, Reid had obtained a medical diploma from the University of Edinburgh in 1830 and after teaching practical chemistry at the university, set up his own private teaching laboratory in 1833.[50] There Reid devised a system of ventilation to remove gases produced during chemical demonstrations. He displayed the power of this system to various audiences, including a delegation of MPs at the 1834 British Association for the Advancement of Science (BAAS) meeting in Edinburgh.[51] Reid claimed to these audience that he could use mechanical apparatus to regulate the chemical composition of the atmosphere of a building. The parliament invited Reid to replicate this atmospheric control at Westminster, and it was just such

[47] John Daniell, 'On the Waters of the African Coast', *Friend of Africa*, 15 January, 1841, 1:2, 18-23; John Daniell, 'A Probable Cause of Miasma', *Friend of Africa*, 1 February, 1841, 1:3, 40.

[48] John Daniell, 'Memoranda for Fumigation by Chlorine', *Friend of Africa*, 25 February, 1841, 1:4, 53-54.

[49] (Anon.), 'Advantages of Medical Science to Africa', *Friend of Africa*, 15 January, 1841, 1:2, 17.

[50] Edward J. Gillin, 'Reid, David Boswell (1805–1863)', *Oxford Dictionary of National Biography*, Oxford University Press, April 2016 [http://ezproxy-prd.bodleian.ox.ac.uk:2167/view/article/23327, accessed 17 Sept 2016]; M. F. Conolly, *Biographical Dictionary of Eminent Men of Fife, of Past and Present Times*, (Edinburgh: Inglis & Jack, 1866), 377; also see Henrik Schoenefeldt, 'The Temporary Houses of Parliament and David Boswell Reid's Architecture of Experimentation', *Architectural History*, 57, 2014, 173-213.

[51] Hugo Reid, *Memoir of the Late David Boswell Reid, M.D., F.R.S.E., & c.*, (Edinburgh: R. Grant & Son, 1863), 12.

an exercise of power which the ACS wanted. The Whig MP Benjamin Smith (1783-1860), impressed with the air quality in the Commons, raised the question of air control on-board the vessels of the Niger Exhibition with the Edinburgh doctor.[52]

Reid was subsequently invited to design and implement an on-board system of air-purification for the three steamships. Working alongside the expedition's chief surgeon, James Ormiston McWilliam (1808-1862), Reid conceived of the ships as self-contained ventilation systems. In two detailed articles published in the *Friend of Africa*, Reid provided details of this scheme. Air would be taken in from a high altitude above the ships, before passing through a 'purificator' and then being pumped around the ships through a network of tubes. A steam-engine driven fanner operated to either pump in purified air or extract putrefied air. To readers of the *Friend of Africa*, Reid evoked a physiological analogy, explaining how

> The fanner may be compared to the heart in the living frame, and the distribution tubes to arteries when they are used for the propulsion of purified air, or to veins when the fanner is arranged in a different manner and extracts foul air.[53]

Reid boasted that his system provided absolute atmospheric control for each ship's crew. Every cabin had several valves, and if all cabins but one had these valves closed 'the whole power of the ventilation might be placed upon' one single apartment.[54] A high pressure was to be maintained in the air tubes so that when the valves were opened, purified air would force itself into the low pressure cabins and apartments. In moving air into cabins, the air pressure within the ship increased relative to the external atmosphere; this, Reid believed, ensured that the disease ridden vapours which he was convinced surrounded the Niger could not enter the ships as air would only be able to escape the pressurised hulls. **(Figure 2)** Reid had tested the 'power of the apparatus' at Laird's shipyard in

[52] David Boswell Reid, 'Dr. Reid on the Ventilation of the Niger Steam Vessels', *Friend of Africa*, 1 February, 1841, 1:3, 43.

[53] Ibid., 44.

[54] Ibid., 45.

Liverpool where, through a series of experiments, he had made the movement of air 'visible' by first filling, and then evacuating the ships with gunpowder smoke. He also impregnated the entering and evacuating air with 'fragrant and volatile oils' to provide a detectable 'odour'.[55] In this way, Reid made the power of his system apparent to both the eye and the nose.

[55] Ibid., 47.

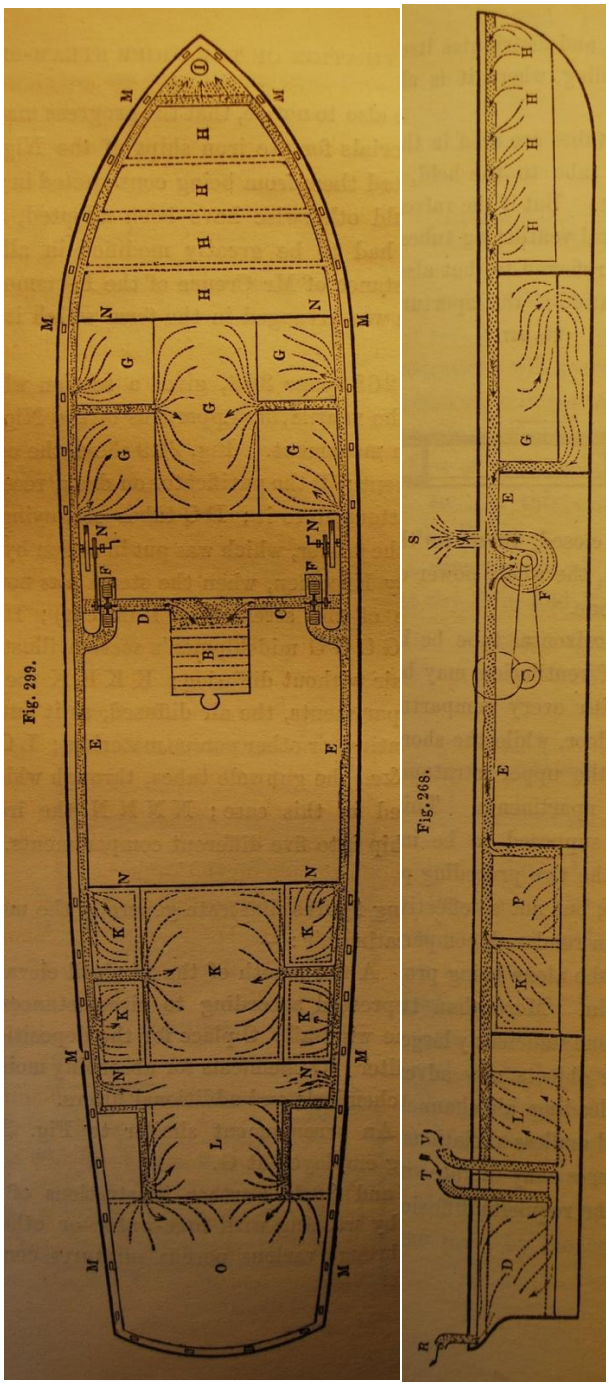

Figure 2: Cross-sectional diagrams of Reid's ventilation system for the Niger Expedition steam ships, published in 1844. In the centre the driving fan can be seen alongside the ship's paddlewheels and connected to the network of ventilation tubes running throughout the vessel. (Taken from David Boswell Reid, *Illustrations of the Theory and Practice of Ventilation, with Remarks on Warming, Exclusive Lighting, and the Communication of Sound,* (London: Longman, Brown, Green, & Longmans, 1844), pp. 368 and 405. Image in author's possession, 2016)

In Reid's second *Friend of Africa* article, he focused on the administration of this ventilation system, as well as on the details of the 'purificator'. To purify the Niger's air for respiration, Reid

provided each ship with an iron-chest divided into compartments with frames of iron-wire. Cloths impregnated with solution could be suspended from these frames and this, Reid asserted, would filter the incoming air of all impurities. Reid confessed that he lacked knowledge of the chemical composition of the air around the Niger basin: this being a problem because he contended that fever was the result of chemicals impregnated within the atmosphere. Crucially he believed that it was this chemical composition which attacked 'powerfully the living frame'.[56] Nevertheless he equipped the expedition with a large supply of chlorine which might decompose any dangerous atmospheric elements. Citing Daniell's laboratory research and BAAS discussions, Reid explained that the large quantities of sulphuretted-hydrogen and carbonic acid gas suspended in tropical air could be absorbed by lime and counteracted by chlorine. Malaria however remained a mystery, probably attributable, he declared, to the humidity of the Niger's atmosphere.[57] If the on-board air quality was diminished, Reid suggested pumping the ships with fragrant oils and purifying gases to provide 'a temporary air bath'. Lacking knowledge of malaria, Reid believed that the purifcator could not be regulated in Africa by 'rules drawn up in a distant country' but had to be 'adapted precisely as a continued practical examination of the air and water'. Reid argued that crews had to include men trained in the chemical principles of ventilation; McWilliam, the expedition's surgeon, would be responsible for directing the use of the purificator and fanner. For Reid this illustrated 'the importance of a knowledge of practical chemistry being acquired generally by those who may have to visit a distant country'.[58]

Reid's work promised to make British influence in West Africa a realistic proposition. These ventilating steamships not only had scientific relevance for the prevention of what was perceived as miasmic disease, but also political significance. Russell himself claimed that while the climate around the mouth of the river was unhealthy, upstream the air was purer. All that was needed, he

[56] David Boswell Reid, 'Dr. Reid on the Ventilation of the Niger Steam Vessels', *Friend of Africa*, 24 March, 1841, 1:5, 65-66.

[57] Ibid., 68.

[58] Ibid., 70.

asserted, was a period of on-board protection while entering the river.[59] Russell ordered the expedition's captain to proceed rapidly through the delta's unhealthy marshes under the protection of Reid's ventilation apparatus, before commencing work up river. If disease did break out, it was agreed that the safest course would be for the crews to return to the ships.[60] While Reid's ventilation apparatus would protect the crews through the initial assent up the Niger until the supposedly healthier higher ground, black Christian members of the expedition, such as the minister and ex-slave Samuel Crowther (c.1809-1891), were to conduct much of the expedition's work on land. The job of converting the Niger's inhabitants was largely entrusted to the non-white crewmen, as was the establishing and running of the proposed model farm. Clearly then, this was a scheme which had racial implications; for crewmen to be sealed in the ships, allowed on shore only for the briefest moments to conduct negotiations with local leaders, was a recognition that Europeans were racially unsuited to the tropical atmosphere. However, the placing of so much trust in Reid's ventilation system shows the extent to which technology was looked to as a solution to any disadvantage Europeans might have in the tropics. While British crewmen were not adept at resisting the River's noxious vapours, they were confident that they had the scientific knowledge at hand to overcome the challenge. During the mid-nineteenth century, European views of climate and race shaped different approaches to Britain's imperial position, with the belief that white Europeans were poorly suited for working in the warm West African climate a dominant one. Increasingly pessimistic attitudes maintained that Europeans could never permanently occupy tropical regions, being racially unsuited.[61] In 1840s' West Africa, disease presented an even greater obstacle, but science in the form of air-purification along with the delegation of work to Christian Africans offered hope of a more active

[59] House of Commons debate, 11 February, 1841, *Hansard*, 3rd Series, 56, 510.

[60] PP. 472 (1843), 6 and 10.

[61] Discussed in, Peter D. Curtin, ' "The White Man's Grave:" image and reality', *Journal of British Studies*, 1:1, 1961, 94-110; to compare with similar questions in India, see Mark Harrison, *Climates and constitutions: health, race, environment and British imperialism in India, 1600-1850*, (Oxford: Oxford University Press, 1999), 111-112 and 121; for European responses, see Peter Baldwin, *Contagion and the state in Europe, 1830-1930*, (Cambridge: Cambridge University Press, 1999), 53; on miasmic theories of disease, see Margaret Pelling, *Cholera, fever and English medicine, 1825-1865*, (Oxford: Oxford University Press, 1978), 21-23 and 37-38.

mandate for European powers. The use of black crewmen to fulfil the objectives of the expedition reiterated the evangelical belief that all peoples, European and African, shared a common humanity as children of God which was the guiding racial framework for the expedition. The reliance on ventilation to protect white crewmen while African members of the expedition worked to convert the river's inhabitants and work the model farm was dependent on an understanding of race that pre-dated the harsher later understanding of Africans as an inherently inferior degraded species of *homo*, unfit for work beyond manual labour.[62]

While past expeditions to the Niger basin had met with disaster, such as Macgregor Laird's (1808-61) in 1832, the government was sure Reid's precautions would ensure success.[63] In the Commons the Whig MP for Northampton, Vernon Smith (1800-73), alleged that the expedition was well prepared and would avoid the difficulties of past attempts to navigate the river. He told parliament that 'every contrivance that could be adopted to prevent the bad effects which were likely to arise from the unhealthiness of the climate would be put in operation'[64] Russell personally approved of delaying the completion of the steamships in order to install Reid's work.[65] Publically, the system of ventilation was shown off as a way of building confidence into the expedition. Before their launch, Prince Albert inspected the vessels on 23 March 1841 and was treated to a demonstration of Reid's ventilating apparatus. The *Friend of Africa* reported that this was of 'peculiar interest' to the prince, who enjoyed Reid replicating his experimental flooding and evacuating of the *Albert* with smoke.[66]

Once underway, the *Friend of Africa* conveyed monthly updates of the expedition's progress to the public. The journal reported that 'The people are ready to receive any White men as teachers,

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[62] Kennedy, *The Last Blank Spaces*, 201-203.

[63] Of a crew of 49 Europeans, only nine returned from Laird's expedition, see Macgregor Laird, 'The Niger Expedition', *Hampshire Advertiser & Salisbury Guardian*, 1 January, 1842, Issue 963.

[64] House of Commons debate, 16 February, 1841, *Hansard*, 3rd Series, 56, 697.

[65] PP. 472 (1843), 24.

[66] (Anon.), 'Niger Expedition', *Friend of Africa*, 24 March, 1841, 1:5, 75-76.

or blackmen acquainted with white man's knowledge'. Such an account for British readers presumed the Niger's inhabitants to be inherently passive in the face of the triumphant and righteous expedition's progress along the river. The public was informed how regular use of the medicator and ventilation apparatus had 'beneficial results' ensuring the health of the crew.[67] Nevertheless, after less than a month, fever broke out. Out of a crew of 302, over seventy were on the sick list by early September 1841, and by 20 September the expedition had claimed twenty-seven lives. Despite this, the journal presented Victorian society with a narrative of triumph. The expedition, according to it, had been able to establish a model European farm on the banks of the river, while losses from fever were portrayed to have been lower than previous expeditions to the region. The journal reported how in the past, crews usually lost over half of their number, but thanks to Reid's apparatus, just a sixth of the crew had perished. It alleged that the 'loss of life is pronounced by every one to all acquainted with Africa, to be less than might reasonably have been expected'.[68] Audiences were further assured that throughout the expedition's trials Trotter had held constant on-board prayers, while during the river's navigation, 'the Sacrament of the Lord's Supper was administered to as many of the officers and men as desired to receive it'. While the medicator purified their air, the crew's souls were 'refreshed with soothing balms of religion'.[69] Special prayers were written for the expedition, calling for divine favour in spreading faith, while also beseeching that no 'plague come nigh our ships'.[70] British readers were presented with a comforting account in which science and Christianity had mutually assured a noble expedition. Such a narrative carried with it the implication that future expeditions to the region could be successful.

[67] (Anon.), 'Latest Accounts from the Niger Expedition', *Friend of Africa*, 1 January, 1842, 2:15, 7 and 4.

[68] Ibid., 5 and 7.

[69] Ibid., 6.

[70] RHL 100.221 s.17, 'Form of Prayer used in the ships of the Niger Expedition', (1841); on faith in the power of the printed word, see Aileen Fyfe, *Science and Salvation: evangelical popular science publishing in Victorian Britain*, (Chicago: University of Chicago Press, 2004), 107.

Narratives and witnesses: ventilation's performance

As the expedition encountered mortality and disease along the Niger, back home in Britain Melbourne's Whig government fell from power in the summer election of 1841. Replacing Russell, Peel appointed Edward Stanley (1799-1869) as the new Secretary of State for War and the Colonies. With reports filtering back of the expedition's misfortunes, Stanley despatched orders in November that the expedition was to be terminated.[71] Both Stanley and the Conservative government were unprepared to finance the high costs of a moralistic foreign policy which targeted the slave trade; their priority was to reduce public spending.[72] In the expedition's aftermath a debate ensued over whether the endeavour had been a successful demonstration of how Britain might open up West Africa to a more expansionist agenda, or if it had been a catastrophic failure emphasizing the limits of British overseas ambition. While for some, it was evidence that Russell's moralistic policies were misguided, others saw hope for future endeavours.

Among the expedition's critics and promoters there was an urgency to interpret the mission's outcomes and present them to wider audiences. Within these readings the performance of the ventilation apparatus was an important concern. In his account of David Livingstone's exploration of the Zambezi River, Lawrence Dritsas explained how science, appearing as a harbinger of disinterested, rational thought, free of bias and superstition, accompanied the promulgation of Christian faith. Technology was consistent with a religious framework which held that Christianity was at the foundation of all scientific and technological advancements. Therefore the performance of modern technologies, especially steamships, was much more than a question of material success or failure, but engendered broader concerns over the superiority of British Christian knowledge. As Dritsas concluded, the failing of a steamship on an expedition presented both a technological, and a

[71] PP. 472 (1843), 57; see RHL 100.221 r.200, one page note, 'Niger Expedition', (8 December, 1841); Angus Hawkins, 'Stanley, Edward George Geoffrey Smith, fourteenth earl of Derby (1799–1869)', *Oxford Dictionary of National Biography*, Oxford University Press, 2004; online edn, May 2009 [http://www.oxforddnb.com/view/article/26265, accessed 15 Oct 2015].

[72] Hyam, *Britain's Imperial Century*, 85; Curtin, *The Image of Africa*, 305; Parry, *The Rise and Fall*, 157.

psychological crisis to those eager to demonstrate that the British understood the tropical African environment better than local inhabitants.[73] In the case of Reid's ventilation apparatus, this was an even greater worry because the challenge of disease threatened to undermine all British ambition on the Niger. The Lord Chief Justice, Lord Denman (1779-1854), summed up these anxieties over the technological failings of the expedition in 1849.[74] He explained that while the people of the Niger were ready to rid themselves of 'superstitions' and embrace 'medical skill', Britain had failed to demonstrate that it possessed powerful medical knowledge. Denham believed that any influence the expedition might have secured was lost thanks 'to the melancholy contrast between the spectacle presented by our steamers in ascending the river and in returning. The dismal change probably weakened their confidence in the power and in the good sense of Englishmen'.[75] The performance of Reid's ventilation was, therefore, inseparably bound from the wider ambitions of the expedition to spread Christian knowledge and faith. However, the question of how his work had performed varied from one commentator to another.

Following the expedition, a multitude of publications followed testifying to its partial, if not total, success. The *Friend of Africa* continued to defend the expedition as an advance in the civilization of Africa.[76] That the model farm had been established with the goodwill of local inhabitants demonstrated that Africans had placed 'the most unbounded confidence in their visitors'.[77] In late August, Obi Ossai, the king of the most powerful tribe below the river's confluence, was invited aboard the *Albert.* According to the *Friend of Africa* he was so impressed with the vessel that he 'begged' the society 'send him a teacher to tell his people about God'. As the three steamers

[73] Lawrence Dritsas, *Zambesi: David Livingstone and Expeditionary Science in Africa*, (London: I. B. Tauris, 2010), 82-83 and 108; on steamships and notions of civilization, see Douglas R. Burgess, *Engines of Empire: steamships and the Victorian Imagination*, (Stanford: Stanford University Press, 2016), 119 and 215-217.

[74] Thomas Denman, *A second letter from Lord Denman to Lord Brougham, on the final extinction of the slave trade, with remarks on a late Narrative of the Niger Expedition in 1841*, (London: J. Hatchard and Son, 1849), 4-5.

[75] Ibid., 8.

[76] (Anon.), 'The Niger Expedition', *Friend of Africa*, 1 February, 1842, 2:16, 18.

[77] (Anon.), 'Narrative of the Niger Expedition', *Friend of Africa*, 1 February, 1842, 2:16, 19.

travelled up river, the journal reported that all who saw them were overwhelmed with wonder. The people of the Niger, one crewman recalled, considered the white men 'a superior race of beings, and believe that we are sent by God for their good'.[78]

Two surviving members of the expedition, Rev James Schön and Rev Samuel Crowther, reported on the triumph of displaying 'the British Nation and character' to the chiefs of Africa, as well as the signing of treaties with those chiefs agreeing to abolish slavery.[79] The steamships' displayed power was central to this reading of success. British audiences could read how, 'natives were seen peeping round the corners of their huts, in fright and astonishment at the "Devil-Ship"'.[80] Schön and Crowther informed their readers that the arrival of the steamships prompted questions from the Niger's inhabitants as to whether the British lived on land at all, or permanently remained on-board; some even wondered if white men had power over the rain.[81] They explained that this display of power had 'served deeply to impress their [the Chiefs] minds with the superiority which White Man's knowledge gives him over Black Man'.[82] The consequence of this, they reported, was that

> They desire "White-Man's Book;" that is, they are desirous to receive Teachers from White Men, that they may thus become possessed of their

[78] (Anon.), 'Latest Accounts from the Niger Expedition', *Friend of Africa*, 1 January, 1842, 2:15, 7; on Obi Ossai, see Ebere Nwaubani, 'The Political Economy of Aboh, 1830-1857', *African Economic History*, 27, 1999, 93-116.

[79] James Frederick Schön and Samuel Crowther, *Journals of the Rev. James Frederick Schön and Mr. Samuel Crowther, who, with the sanction of Her Majesty's Government, accompanied the Expedition up the Niger, in 1841, on behalf of the Church Missionary Society*, (London: Hatchard and Son, 1842), vi-vii; for a religious account, see William Simpson, *A Private Journal kept during the Niger Expedition, from the commencement in May, 1841, until the recall of the expedition in June, 1842*, (London: Hamilton, Adams & Co, 1843).

[80] William Allen and T. R. H. Thomson, *A narrative of the Expedition sent by Her Majesty's Government to the River Niger, in 1841*, 2 Vols, (London: Richard Bentley, 1848), I, 184.

[81] Temperley, *White Dreams*, 109.

[82] Schön and Crowther, *Journals*, viii.

> knowledge, and of that power and those numerous advantages which knowledge, they clearly perceive, carries along with it.[83]

The expedition was thus portrayed to be actively demonstrating how Christian knowledge was superior to African. These accounts were consistent with wider beliefs that while Africans had fallen behind European civilization, they were capable of being improved through the diffusion of British faith and science.[84] In later reports it was described how the river's inhabitants trusted McWilliam's medical knowledge to the extent that they allowed him to perform vaccinations against small-pox and learnt how to perform this preventative for themselves.[85]

Trotter's 1843 report of the expedition supported these readings. In his accounts of the two treaties signed with African chiefs, he described how those living along the Niger were eager for British knowledge and Christian faith. The first treaty was signed with Obi Ossai of Aboh, who was described in an almost childlike fashion, eagerly taking instructions. He apparently wanted to learn 'the books and principles … of an enlightened nation' while promising not to deal in slaves. When told how white men found it 'easy' to ascend the river, king Obi appeared 'astonished'.[86] He agreed to trade in ivory and palm oil before being treated to a reading of the Ten Commandments. When then asked 'Is not this a very good religion', Trotter reported how the king meekly agreed.[87] The second treaty included the acquisition of land for a settlement, signed with the Chief of Eggarah, the Attah of Iddah. The Attah agreed to end slavery and open his land up to Christianity. He appeared impressed at the power of the British Queen and gladly accepted an Arabic Bible.[88] Before securing a plot of land, the expedition's bugler gave a rendition of 'God Save the Queen', much to the Attah's

[83] Ibid., ix.

[84] Dritsas, *Zambesi*, 50.

[85] Samuel Abraham Walker, *The Church of England Mission in Sierra Leone; including an introductory account of that colony, and a comprehensive sketch of the Niger Expedition in the year 1841*, (London: Seeley, Burnside, and Seeley, 1847), 490.

[86] PP. 472 (1843), 141.

[87] Ibid., 144.

[88] Ibid., 147-148.

amusement. At Addah Kudda the expedition's officers met the Attah's agents to mark out an area of land where a fort could be constructed, along with a model farm.[89] What these accounts did was more than present the Niger's inhabitants as entirely submissive to British religion and knowledge, but vindicated the entire expedition. Its aims appeared achievable; such accounts made it seem that the Niger's inhabitants wanted British interaction.

In contrast to these optimistic narratives, other sources reported the expedition to have been of the 'most disastrous character'.[90] Approving of Stanley's termination of the expedition, Jamieson damned the waste of over £100,000 of public funds for an unprofitable piece of land surrounded by 'pestilential swamp'.[91] Similarly *The Times* presented a 'narrative' from what it described as 'facts', which made for a 'melancholy story' in which Man's power had been found wanting against the challenge of nature.[92] The expedition had failed to abolish slavery or convert the Niger's inhabitants to Christianity. Buxton's *Friend of Africa* had succeeded only in taking advantage of the 'easy credulity of the Exeter-hall-going portion of the British people'. *The Times* emphatically concluded that the 'Exeter-hall meetings, the speechifying, and the pamphleteering about the civilization of Africa … [have] borne their miserable but not unforeseen fruit'.[93] *The Times* had openly supported the Conservative opposition to Melbourne's government and now condemned the expedition as a political, rather than moral, endeavour.[94] *The Times* was particularly alarmed that the model farm which had been established had itself become a model of slavery, with reports of the black crewmen left in charge choosing to take on their own slaves.[95] In newspapers beyond *The Times* there was a

[89] Ibid., 41.

[90] (Anon.), 'The Niger Expedition', *The Times*, 20 January, 1842, 5; Issue 17885.

[91] Robert Jamieson, *Sequel to appeals made to the government and people of Great Britain, against the Niger Expedition before its departure from England*, (London: Smith, Elder, & Co, 1843), 13.

[92] (Anon.), 'The Niger Expedition', *The Times*, 22 January, 1842, 5; Issue 17887; "A Surgeon", 'Niger Expedition. – Prevention of Fever', *The Times*, 20 January, 1842, 5; Issue 17885.

[93] (Anon.), 'The Importance of the Subject…', *The Times*, 24 January, 1842, 4; Issue 17888.

[94] Temperley, *White Dreams*, 60-61.

[95] Lambert, *Mastering the Niger*, 204.

wide consensus that the expedition had indeed been an abysmal failure.[96] As for the credibility of the *Friend of Africa*, it appeared diminished in the face of the expedition's impotence. One anonymous commentator, contrasting *The Times's* narrative of disaster to the expedition promoters' accounts of achievement, wondered 'upon whose authority the statement published in the *Friend of Africa* … are made'. The journal's claims of successfully converting local peoples to Christianity lacked credibility.[97]

Within this criticism of the expedition the performance of its air-purification came under scrutiny. The extent to which Reid's work had protected the crews or altered the environment in which they worked was contended. *The Times* was particularly damning of Reid's system, believing it had failed to contain 'the demon of pestilence'.[98] Even before the expedition left England, concerns surrounded the integrity of the apparatus. At the 1841 Plymouth BAAS meeting Reid presented a paper on his 'arrangements adopted in the steam-ships of the Niger Expedition'. Made to the Medical Science Section of the BAAS, Reid presented at Devonport alongside papers from Marc Brunel on his Thames Tunnel project, and watchmaker Edward John Dent (1790-1853) on recent improvements to clocks and chronometers. Despite appearing alongside such eminent authorities, the audience received Reid poorly, with one reviewer describing how in his paper, Reid had taken up 'so much space in opening the *valves* … that he left himself no time for its sufficient *winding* up'.[99] While the *Friend of Africa* promoted Reid's scientific knowledge, to wider audiences it was more critically considered.

These reservations were in part attributable to Reid's ventilation of the Houses of Parliament. While journalists had little experience of the effects of ventilation on the Niger, they had first-hand

[96] (Anon.), 'The Niger Expedition', *Morning Post*, 22 January, 1842, Issue 22158.

[97] "X", 'The Niger Expedition', *The Times*, 23 December, 1842, 5; Issue 18174.

[98] (Anon.), 'The Niger Expedition', *The Times*, 22 January, 1842, 5.

[99] (Anon.), 'Arts and Sciences. British Association', *Literary Gazette and Journal of Belles Lettres, Arts, Sciences, &c.*, 28 August, 1841, 1284, 563; also see Jack Morrell and Arnold Thackray, *Gentlemen of Science: early years of the British Association for the Advancement of Science*, (Oxford: Oxford University Press, 1981), 265.

knowledge of Reid's air purification at Westminster. In the early 1840s, Reid's working relationship with the building's architect, Charles Barry (1795-1860), had become increasingly fraught, with both men contending how best to organize the Palace's ventilation. These disagreements appeared to the press to be responsible for growing delays to progress in the building's construction. Reid's ventilation took on significance for apparently preventing the parliament from governing efficiently. *The Times* quickly sided with Barry and denounced all of Reid's projects as failures. While in January 1841 the paper described how the Niger Expedition's ventilation apparatus was 'fitted under the able superintendence of Dr. Reid', by March 1845, it depicted Reid's work as an embarrassment.[100] One of the paper's reporters, after a night in the House of Commons, declared that a 'more egregious failure than Dr. Reid's "experiments" have hitherto proved cannot be imagined'. Reid appeared, as in Africa, to provide no control over temperature or air quality; his work urgently demanded judgement from reliable 'witnesses' and 'men of undoubted science'.[101] The *Athenaeum* joined in this attack, reporting that in Reid's attempts to ventilate Parliament, 'as in the Niger ships, he has totally and signally failed'.[102] It concluded that on the Niger, 'the ventilation and medication of the air did no good', and that the expedition was a scientific failure.[103] At Parliament, Reid's work was constantly under the scrutiny of the national press, and this brought his scheme for the Niger expedition under intensive examination.

Unsurprisingly, there was a rigorous defence of Reid's apparatus. Promoters of his ventilation scheme worked to make British audiences aware that Reid's chemistry was behind the expedition's demonstration of British Christian knowledge. Reid worried that both *The Times* and the *Athenaeum* had severely undermined the credibility of his on-board ventilation system with the British public. While *The Times* cited testimonies from reporters experiencing Reid's ventilation in the

[100] (Anon.), 'We have recently paid a visit to the Soudan…', *The Times*, 14 January, 1841, 6; Issue 17567.

[101] (Anon.), 'We heard last night…', *The Times*, 21 March, 1845, 5; Issue 18877.

[102] David Boswell Reid, *Ventilation. A Reply to misstatements made by "The Times" and by "The Athenaeum" in reference to ships and buildings ventilated by the author*, (London, 1845), 21.

[103] (Anon.), 'Illustrations of the Theory and Practice of Ventilation, with Remarks on Warming, Exclusive Lighting, and the Communication of Sound. By D. B. Reid, M. D.', *The Athenaeum*, 16 March, 1844, 855, 238-240, 240.

House of Commons, Reid asserted the paper had no scientific authority.[104] The problem, as Reid saw it, was that individuals experienced the same air differently, depending on their constitution. A reporter from *The Times*, sitting in the Commons, might not feel comfortable in air provided from Reid's system, but that same reporter lacked understanding of what healthy air was. Reid's ventilation on the Niger, in appearing to reduce European mortality rates was, he asserted, proof of the power of his system rather than the unreliable accounts of a newspaper reporter.

In response to the *Athenaeum* he conceded that such a learned journal, 'in a calm review of a scientific work, of course receives some degree of credit'.[105] However, while he agreed that the expedition had not been a complete success, the ventilation was an outstanding feature, which offered direction for future work in fever prevention. Yet without experience of the river's atmosphere, all Reid's system could do was to assist the 'strength of the crew', which he felt had been achieved. As 'the atmosphere had never been made the subject of experimental examination', Reid, lacking chemical knowledge of the atmosphere around the river Niger, could control, but not purify, incoming air. Reid recalled how at Devonport, Trotter had felt the vessel securely ventilated and commended the 'state of perfection' that was attained. Reid noted that even the sceptical Commander Allen of the *Wilberforce* came to appreciate the ventilation by the time the expedition reached Tenerife. Likewise, Commander Fishbourne of the *Soudan* testified to the 'perfect health' provided. Reid described how Fishbourne had suffered a terrible headache on the river but, after having a 'large quantity of chlorine evolved and circulated through the vessel', felt his pain subside.[106] Before the 1841 expedition, Reid cited 80% death rates for Europeans living on the Niger delta. However, his system, including the fanner, medicator, and circulation tubes, seemed to reduce this. Reid's claims found much support in

[104] Reid, *Ventilation. A Reply*, 12.

[105] Ibid., 21.

[106] Ibid., 22 and 24-25.

the *Lancet* which approved of his work, despite somewhat ambiguously describing his project on the Niger as 'curious and interesting'.[107]

Reid's attributing of his system's shortcomings to the specific chemistry of the Niger's atmosphere is interesting because it has implications for our understanding of the relationship between scientific credibility and locality. While scientific knowledge could secure authority from being produced in the field, and heroic narratives of exploration often enhanced the credibility of knowledge claims, Reid actually used the locality of the Niger not only to explain why his apparatus had limitations, but to assert that it was successful.[108] Reid maintained that knowledge of how his apparatus had performed was only credible if it came from witnesses. Historians have recognized that travel and experience could be valuable contributors to scientific credibility, with explorers and practitioners of fieldwork providing rival sources of information to 'armchair' authorities. As Dane Kennedy has rightly surmised, though their authority could often prove fragile, explorers were keen to fashion themselves as men of science.[109] Yet what Reid was doing was actually far more complex. He was combining eye-witness testimonials from members of the expedition with his own research in Britain to assert that his ventilation apparatus had been effective. Thus local knowledge needed to the tempered with metropolitan explanation. This was a careful strategy to establish his own reading of how his system had performed.

Reid was keen that his audiences in Britain should recognize the authority of those who had personally witnessed his system in Africa, arguing that 'no adequate idea can be formed of the extreme severity and oppressive influence of the atmosphere of the Niger … by those who have had

[107] (Anon.), 'Review: Illustrations of the Theory and Practice of Ventilation, with Remarks on Warming, Exclusive Lighting, and the Communication of Sound', *The Lancet*, 5 October, 1844, I, 68-69, 69.

[108] David N. Livingstone, *Putting Science in its Place: geographies of scientific knowledge*, (Chicago: University of Chicago Press, 2003), 41-3; on science and exploration, see Michael F. Robinson, 'Science and Exploration', in Dane Kennedy, ed, *Reinterpreting Exploration: the West in the World*, (Oxford: Oxford University Press, 2014), 21-37, esp 28.

[109] Kennedy, *The Last Blank Spaces*, 57-58.

no practical experience of the subduing effects which they produce on European constitutions'.[110] The expedition's surgeon provided the greatest testimony of Reid's work having witnessed the ventilation first hand. McWilliam's *Medical History of the Expedition* provided a narrative in which Reid's apparatus had performed effectively in improving the atmosphere of each ship involved in the expedition. He felt that the medicator to be 'a most useful, elegant and economical medium for subjecting the external atmosphere to the action of chemical and other agents'.[111] Having become a licentiate of the Edinburgh College of Surgeons in 1827, a Royal Navy assistant surgeon from 1829, and graduating MD from Edinburgh University in 1840, McWilliam became senior surgeon to the *Albert* in September 1840. His narrative provided an eyewitness analysis of Reid's system in action.[112] McWilliam explained how from Madeira, the 'ventilation was performed every day by both plenum and vacuum impulses, and succeeded admirably'. When the fanner was disconnected from the tubes, McWilliam reported the temperature rising rapidly, while when it was reattached, control was quickly restored.[113] McWilliam recalled how it was 'evident that we possessed a means at command by which a uniform supply of fresh air was afforded'.[114] His description of the journey up the Niger continued in this enthusiastic vein. All the time the voyage appeared to be under the protection of Providence and ventilation. However, at the Niger's confluence with the River Tchadda, McWilliam reported seven fatalities.[115] The *Wilberforce* abandoned the expedition to carry the sick back to the coast. On 25 September McWilliam observed a 'skeleton' congregation at Divine Service and by 27 September, despite a much appreciated diffusion of chlorine via the fanners, the *Soudan* and *Albert* returned to the coast too. Overall he reported that 130 out of 145 Europeans were taken ill,

[110] David Boswell Reid, *Illustrations of the Theory and Practice of Ventilation, with Remarks on Warming, Exclusive Lighting, and the Communication of Sound*, (London: Longman, Brown, Green, & Longmans, 1844), 27.

[111] Reid, *Ventilation. A Reply*, 23.

[112] W. A. Greenhill, 'McWilliam, James Ormiston (1808–1862)', rev. Lynn Milne,*Oxford Dictionary of National Biography*, Oxford University Press, 2004 [http://www.oxforddnb.com/view/article/17747, accessed 28 April 2014]; M'William, *Medical History of the Expedition*, 3 and 5.

[113] Reid, *Ventilation. A Reply*, 24.

[114] M'William, *Medical History of the Expedition*, 8.

[115] Ibid., 77 and 81.

with forty succumbing to the fever. Despite this, McWilliam praised Reid's system, which was the first attempt 'to place every compartment of a ship under the immediate and direct control of ventilating power'.[116]

McWilliam qualified Reid's work on the Niger as an experiment and supported the assertion that what Reid lacked was knowledge of the chemical qualities of the Niger's atmosphere. Nevertheless, he felt Reid had designed a system which successfully controlled each ship's internal air. McWilliam referenced an official government review of the system, commissioned for the Royal Navy. William Burnett (Inspector-General of Naval Hospitals and Fleets) reported that throughout the expedition, the crews of the *Albert* had testified to the impulse of ventilation. On examining the ship's medicator, he found evidence in the form of collected vegetable fibres, grass, and 'black matter', that Reid had provided 'purified air' to many parts of the *Albert*.[117] In these readings of the apparatus, ventilation was not presented as a cure for disease, but as a powerful preventative. However, cures and preventatives were both solutions to the problem of disease, and in the early 1840s, ventilation was constructed as the most potent answer to fever. As a result, readings of how it had performed really mattered because they had political implications. Even if the apparatus had not stopped the spread of disease, if it could be shown that it had potential to make future ventures into Africa safe, then it could become a powerful resource in debates over Britain's role in the region.

When Rev Crowther returned to the River Niger as part of an expedition in 1854 he reflected on how the 1841 expedition had taken every precaution to prevent an outbreak of disease and refused to attribute its failure to Reid's ventilation apparatus. The fault lay not with inefficient ventilation. Crowther supposed that 'miasma may have been created by the raw and green wood for fuel kept in the bunkers for days together, and by the noxious exudation and vapour issuing therefrom, and by the mixture of chips and bark with the bilge water'.[118] In this reading, Reid's system had been

[116] Ibid., 252.

[117] Ibid., 262 and 266-267.

[118] Samuel Crowther, *Journal of an Expedition up the Niger and Tshadda Rivers, undertaken by MacGregor Laird, esq. in connection with the British Government, in 1854*, (London: Seeley, Jackson, and Halliday, 1855), 12.

undermined by the ships' supply of fuel. While Reid had no role in the 1854 expedition and his ventilation apparatus was not used, the crew embraced Crowther's recommendation that all fire wood be kept in canoes and toed behind the expedition's steamships. While the miasmic threat was still taken seriously, the strategy in 1854 was to travel in the dry season, well before August, and get into Africa's interior as quickly as possible.

Conclusion

Early-Victorian notions of miasmic disease and theories over climate and health informed perceptions of imperial expansion. This article has suggested an example of how, within this relationship, technology played a significant part. Nevertheless, the way in which technology fit within debates over colonial activity was often unclear. Instead of identifying triumphant technologies and medicines, such as quinine and steam-ships, which had an apparently determining impact on the course of European expansion, much can be learnt from technologies which in hindsight had little material influence. It is clear that a technology's cultural value was not necessarily linked to what appears, in hindsight, to have been its material worth. In the early 1840s it was not in quinine that anti-slavery campaigners placed their trust, but in ventilation apparatus. Technology was a significant character in political debates over West African intervention, but it was not the same technology as that which Headrick identified as central to historical accounts of nineteenth-century expansion. Reid's on-board ventilation systems did not prevent the spread of disease, but they did embody Christian morality and scientific hubris, and there was, as a result, a significant social consensus within Victorian Britain that they represented progress.

To understand technology's prominent role in imperialism, we should look to the 'failures' as much as the 'triumphs'. Reid's ventilating steamships might have contributed little to the expedition's fortunes or the health of its crews, but they did matter to wider questions over British power in Africa, Christianity's potential to convert, anti-slavery efforts, the judgement of Melbourne's Whig government, and the post-1841 Conservative retreat from overseas obligations. Through eye-

witness testimonies and dramatic narratives from both Westminster and the Niger, Reid's work provided public discussions with lessons on the future of British intervention in West Africa. British audiences read accounts in which faith and science appeared to have brought enlightenment to the Niger. Being able to navigate the Niger, apparently armed with a solution to the threat of disease, was a way of demonstrating a hierarchy between scientific knowledge and the superstitions of the river's inhabitants. Although in hindsight Reid's ventilation apparatus did not secure the health of the expedition, contemporaries portrayed his system as a powerful technology for a broad range of political, economic, and religious reasons. For Victorian audiences, Reid's ventilation seemed successful because it fit within triumphant notions of Christian civilization and rational science. Clearly narratives in which European knowledge was powerless to halt the ravages of disease hardly aided notions of superiority. Even when a large proportion of the crew perished from fever, the expedition's promoters worked hard to show that a solution to tropical disease was at hand. To understand why society placed its hopes and trust in schemes such as Reid's ventilation, we have to look beyond those technologies traditionally regarded to have been triumphant, and explore those which contemporaries believed would be successful in the future.