

“The very air is a vital essence”: Pneumaticism at the Poles

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Article abstract

I discuss the culture of accurate and dispassionate mensuration in an Arctic that was, for the first time, predictably attainable—a technologized Arctic near enough to be reached and subjected to experiment. My purpose is to develop, in the context of the discourse of polar exploration and the British responses to that discourse made by poets and fiction writers, recent arguments about the culture of scientific experiment and the so-called rise of “objectivity” that have been made by historians of science. The effect of these arguments has been to suggest that a mutually reinforcing objectification of experiment narrative and establishment of professional institutions set nineteenth century science apart from natural philosophy as practised by amateur eighteenth-century gentlemen—Erasmus Darwin being a typical gentleman of that kind.

Here, I suggest that the extreme regions of the poles not only challenged the authority of accurate observation as a defining virtue of science from within the discourse of science, but also inspired fictional narratives that challenged it—and thus called the new science into question. Thus I reveal the effects, in literary texts and the wider culture as well as in expedition narratives and scientific discourse, when experiments did not produce predictable results, or failed completely to comprehend their subjects. I suggest that because of its simultaneous availability and resistance to investigation, the Arctic became an external representative of the fear and desire buried within scientific objectivity. It has remained fascinating in the European cultural imaginary for this reason, as an Other, embodying fear but also longing for a world that eludes mastery by our technologies of knowledge-production. A consequence of this is that aspects of the Arctic have been used by Europeans to configure alternatives and oppositions to scientific culture as it was practised from the early nineteenth century onwards. Specifically, “The Ancient Mariner” and *Frankenstein* interrogate the claims of “objective” report and accurate experiment and, in doing so, remodel Erasmus Darwin’s fictionalisation and poeticisation of scientific discourse for a more vexed and hostile literary context than the one in which he wrote

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Romanticism and Victorianism on the Net

“The very air is a vital essence”: Pneumaticism at the Poles

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Abstract

I discuss the culture of accurate and dispassionate mensuration in an Arctic that was, for the first time, predictably attainable—a technologized Arctic near enough to be reached and subjected to experiment. My purpose is to develop, in the context of the discourse of polar exploration and the British responses to that discourse made by poets and fiction writers, recent arguments about the culture of scientific experiment and the so-called rise of “objectivity” that have been made by historians of science. The effect of these arguments has been to suggest that a mutually reinforcing objectification of experiment narrative and establishment of professional institutions set nineteenth century science apart from natural philosophy as practised by amateur eighteenth-century gentlemen—Erasmus Darwin being a typical gentleman of that kind.

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Biographical Note

Tim Fulford is Professor of English at De Montfort University. He writes on Romantic era literature in the contexts of colonialism, exploration, science, landscape, the picturesque, and religion. He has published many articles and books on these topics, featuring such writers as William Wordsworth, S. T. Coleridge, Robert Bloomfield, Mary Robinson, William Cowper, Jane Austen, and John Clare. He is currently preparing scholarly editions of the writings of Robert Bloomfield and the letters of Humphry Davy. His next monograph will be a study of Wordsworth’s poetry from 1815 to 1845.

1. When in 1767 the Danish missionary David Crantz wrote that in Greenland “the very air is a vital essence” he was responding to an Arctic in which the spiritual was not separable from the material, and the soul was perceptible outside as well as inside the body (Crantz I: 209). I will return to the original context of Crantz’s remark later, but I begin by, as it were, putting pressure on its terms. Air, vitality, and essence: over the next sixty years these concepts became charged, in ways that Crantz could not have anticipated. They did so because scientific experimentalists discovered that the air was composed of gases (in their terminology, “airs”) and that its composition might not be the same in the Arctic as in the streets of London and in the wooded vales of England.
2. In what follows, I shall discuss the culture of accurate and dispassionate—“objective”—mensuration in an Arctic that was, for the first time, predictably attainable—a technologized Arctic near enough to be reached and subjected to experiment. My purpose is to develop, in the context of the discourse of polar exploration and the British responses to that discourse made by poets and fiction writers, the debate instituted by the arguments about the culture of scientific experiment and the so-called rise of “objectivity” that have been made by historians of science. Among these historians are Simon Schaffer, Lorraine Daston, and Peter Galison; the effect of their work has been to suggest that a mutually reinforcing objectification of experiment narrative and establishment of professional institutions set nineteenth century science apart from natural philosophy as practised by amateur eighteenth-century gentlemen—Erasmus Darwin being a typical gentleman of that kind.¹ This process also, as Jon Klancher has implied,² had been held responsible for the rise of distinct disciplines, and the consequent alienation of “scientist” (a new term coined to designate the professional researcher) from other kinds of enquirer and writer.
3. Here, I suggest, in the wake of historians of exploration and exploration narratives, including Michael Bravo, Fergus Fleming, and Eric G. Wilson, that the extreme regions of the poles not only challenged the authority of accurate observation (and therefore objectivity) as a defining virtue of science from within the discourse of science, but also inspired fictional narratives that challenged it—and thus called the new science into question. Thus I reveal the effects, in literary texts and the wider culture as well as in expedition narratives and scientific discourse, when experiments did not produce predictable results, or failed completely to comprehend their subjects—when the polar air confounded expectations, defied the instruments, and refused to be registered on the calibrated scales. I suggest that because of its simultaneous availability and

resistance to investigation, it became an external representative of the fear and desire buried within scientific objectivity. Polar air was familiar—the atmosphere we all breathe—yet became a strange, uncanny medium because it signified the thrilling anxiety that nature might slip from science’s grasp, elude the record, escape its power. It has remained fascinating in the European cultural imaginary for this reason, as an Other, embodying fear but also longing for a world that eludes mastery by our technologies of knowledge-production. A consequence of this is that aspects of the poles—especially the ice, sea and sky scapes and the spiritual beliefs of indigenous people—have been used by Europeans to configure alternatives and oppositions to scientific culture as it was practised from the early nineteenth century onwards. Specifically, “The Ancient Mariner” and *Frankenstein* interrogate the claims of “objective” report and accurate experiment and, in doing so, remodel Erasmus Darwin’s fictionalisation and poeticisation of scientific discourse for a more vexed and hostile literary context than the one in which he wrote. And in both texts, it is the polar air, materialising shapes and sounds within and without the body, which becomes a thick medium of uncertainty rather than a transparent window onto truth.

Gentle Breezes and Storms of Wind

4. Air materialized, to be captured and measured, as a result of Joseph Priestley’s 1774 discoveries. Showing that it was not an element, he released from it, for the first time, gases with extraordinary properties. Carbon dioxide brought water to fizzing life; “dephlogisticated air” enlivened people: “The feeling of it in my lungs,” Priestley wrote, “was not sensibly different from that of common air, but I fancied that my breast felt peculiarly light and easy for some time afterwards. Who can tell but that in time, this pure air may become a fashionable article in luxury?” (Priestley II: 102) Termed oxygen by Lavoisier, this gas, capable of reviving the almost dead, was commonly called “vital air.” It became the chief object of experiment in the new science of pneumatics, developed both theoretically and practically by Erasmus Darwin. In *Zoonomia* Darwin argued that external inputs into the body, including inhalations, undergo chemical conversion in the “sensorium”—a system circulating a nervous fluid through the spinal marrow to and from the brain, organs of sense and muscles (I: 9-10). This system, therefore, constituted the living principle as it works in animal beings in interaction with the “vital air” they absorb from outside. In a healthy person there was a normal, proper balance

between external and internal: the sensorium produced vitality in response to excitement by external stimuli, and this was discharged by activity. An unhealthy person, by contrast, exhibited either deficiency or excess of vitality, having developed under or over sensitivity to excitement. Someone who alternated between low and high levels of exciting stimulation might become a desensitized addict needing higher and higher doses just to feel normal—Darwin instanced the boom and bust cycle of people who spent much of their day confined in the stagnant air of drawing rooms or workshops and then over-compensated by dosing themselves with stimulants such as opium or good wine. People accustomed to too little excitement, but who did not over-compensate, became torpid. Regulation of stimulation and activity was the principal aim of Darwin’s Brunonian³ medicine, and controlled exposure to regular, safe levels of “vital air” was needed to restore a healthy balance and repair damaged sensoriums. Darwin therefore prescribed pneumatic treatments for several of his patients who were wealthy enough to afford the breathing apparatus designed and supplied by his and Priestley’s mutual friend James Watt.

5. Darwin pursued the consequences of Priestley’s discoveries on a global as well as individual scale. By 1791, he was applying the new science to the poles. In his poem *The Economy of Vegetation* he envisaged the atmosphere at the Arctic and Antarctic as a complex medium in which different gases, preponderant at different altitudes, refract sunlight, transforming the visual field:

Where lighter gases, circumfused on high,
Form the vast concave of exterior sky;
With airy lens the scatter’d rays assault,
And bend the twilight round the dusky vault;

(Canto I, lines 121-26; Darwin 1791: 11)

A note explained, on the basis of analogies, how centrifugal forces made the polar atmosphere a different gaseous mixture from that found at other latitudes. There, in the upper atmosphere, a blanket of the newly isolated gas hydrogen—“inflammable air”—overlaid the common air.

If this supernatural gaseous atmosphere floats upon the aerial one, like ether upon water, what must happen? 1. it will flow from the line, where it will be produced in the greatest quantities, and become much accumulated over the poles of the earth: 2. the common air, or lower stratum of the atmosphere, will be much thinner over the poles than at the line: because if a glass globe be filled with oil and water, and

whirled upon its axis, the centrifugal power will carry the heavier fluid to the circumference, and the lighter will in consequence be found round the axis. 3. There may be a place at some certain latitude between the poles and the line on each side of the equator, where the inflammable supernatant atmosphere may end, owing to the greater centrifugal force of the heavier aerial atmosphere.

Where the hydrogen-rich upper atmosphere and oxygenated lower atmosphere mixed, a level that was especially inflammable was produced.

Between the termination of the aerial and the beginning of the gaseous atmosphere, the airs will occasionally be intermixed, and thus become inflammable by the electric spark; these circumstances will assist in explaining the phenomena of fire balls, northern lights, and of some variable winds, and long-continued rains.

Here, the freedom given Darwin by his decision to present scientific theory in footnotes to the fanciful discourse of poetry allows him to set aside empirical measurement and the objectivity that measurement is used to produce, and instead to pursue analogy. Using poetic license, he is able to envision the atmosphere as a variable and dynamic global system interacting with light, electricity and vegetation. If this is to build a typically bold and untestable speculation on the observed fact of polar refraction, it nevertheless synthesizes the recent discoveries of Priestley and of Ingenhousz who showed that not only does vegetation convert carbon dioxide to oxygen, renewing the breathable air, but also that the process depends on sunlight.

6. Because oxygen renewed enervated bodies and minds, its improved circulation offered the prospect of a healthier, more vital form of society. Darwin fancifully imagined the sponsoring muses of his poem, “nymphs,” following the route of Arctic explorers towards the pack ice of the north. Once there, they contrive to move icebergs south, so as to transfer enlivening atmospheres from the frigid airs of the pole to “feverish climates” afflicted with “fainting Zephyrs”. In a playful note, he adds that towing icebergs to the torrid zones to relieve their unhealthy climate would be a better use of the Navy than perpetual warfare.

There in her azure coif and starry stole,
Grey TWILIGHT sits, and rules the slumbering Pole;
Bends the pale moon-beams round the sparkling coast,
And strews with livid hands eternal frost.

There, NYMPHS! alight, array your dazzling powers,
With sudden march alarm the torpid Hours;
On ice-built isles expand a thousand sails,*
Hinge the strong helms, and catch the frozen gales;
The winged rocks to feverish climates guide,
Where fainting Zephyrs pant upon the tide;
Pass, where to CEUTA CALPE'S thunder roars,
And answering echoes shake the kindred shores;
Pass, where with palmy plumes CANARY smiles,
And in her silver girdle binds her isles;
Onward, where NIGER'S dusky Naiad laves
A thousand kingdoms with prolific waves,
Or leads o'er golden sands her threefold train
In steamy channels to the fervid main,
While swarthy nations croud the sultry coast,
Drink the fresh breeze, and hail the floating Frost,
NYMPHS! Veil'd in mist, the melting treasures steer,
And cool with arctic snows the tropic year.
So from the burning Line by Monsoons driven
Clouds sail in squadrons o'er the darken'd heaven;
Wide wastes of sand the gelid gales pervade,
And ocean cools beneath the moving shade.

*If the nations who inhabit this hemisphere of the globe, instead of destroying their sea-men and exhausting their wealth in unnecessary wars, could be induced to unite their labours to navigate these immense masses of ice into the more southern oceans, two great advantages would result to mankind, the tropic countries would be much cooled by their solution, and our winters in this latitude would be rendered much milder for perhaps a century or two, till the masses of ice became again enormous.

(Economy of Vegetation Canto I, lines 513-48 and note)

7. It was this idea that Coleridge picked up in 1796, at the height of his revolutionary enthusiasm for the social and political transformation of Europe, when he imagined a “millennium . . . as brought about by progression in natural philosophy—particularly, meteorology or science of airs & winds” (Coleridge 1957-2002 I: 133). Darwin’s pneumatic text, with its mixture of poem and notes, inspired Coleridge because its understanding of the world as an “economy” of interacting processes was so neatly informed by its generic hybridity. The mutually informing verse and prose modelled and in turn reinforced the portrait of a globe in which diverse forces were constantly in changing relationships. Thus Coleridge, having read Darwin, composed poetry leavened with notes that aimed formally to exemplify its vision of a world progressing to a millennial state as material and spiritual processes reconcile. These processes included both the spread of mild air from temperate regions to “melt the primaeval North” and the advance of human spirit, evidenced by Milton’s poetic song (inspired by “odorous groves” as if it were “vital air” breathed out by oxygenated vegetation):

Old OCEAN claps his hands! The DESERT shouts!
And soft gales wafted from the haunts of Spring
Melt the primaeval North! The mighty Dead
Rise to new life, whoe’er from earliest time
With conscious zeal had urg’d Love’s wond’rous plan,
Coadjutors of God. To MILTON’S trump
The odorous groves of earth repara-dis’d
Unbosom their glad echoes

(“Religious Musings,” (1796), 382-89; Coleridge 1912, I: 122-3)

Scientific thought itself constituted an example of the coming reconciliation, since in order to discover nature’s dynamic it modelled and thus embodied the world. Thus Newton, Hartley and Priestley were embodiments of the intelligence-in-action they discovered in (and as) the universe in which all moves, thinks and breathes:

Adoring NEWTON his serener eye
Raises to heaven: and he of mortal kind
Wisest, he first who mark’d the ideal tribes
Down the fine fibres from the sentient brain
Roll subtly-surg-ing. Pressing on his steps
Lo! Priestley there, Patriot, and Saint, and Sage. (390-95)

8. Coleridge’s interest in Darwin waned when he discovered that the Doctor’s pursuit of the “science of airs,” whether in verse or prose, was not coupled to belief in the Christian scheme. His interest in the science itself, however, persisted, and from 1795 until at least 1800, he regarded it as being likely to produce cures for consumption. In Bristol, he was part of an intellectual circle that gathered around Darwin’s protégé Thomas Beddoes, who, with support from Darwin and James Watt, was researching the curative properties of oxygen and other gases. In 1799 he befriended Humphry Davy and participated in the exhaustive trials of nitrous oxide and other ‘aires’ that Davy was conducting, for Beddoes, at the Pneumatic Institution. Even after he left Bristol, he retained his enthusiasm for pneumatic treatments, telling Davy, after a windy walk on a Lakeland fell in October 1800,

On this mountain Carrock, at the summit of which are the remains of a vast Druid Circle of Stones, I was wandering –; when a thick cloud came on, and wrapped me in such Darkness that I could not see ten yards before me—and with the cloud a storm of Wind & Hail, the like of which I had never before seen & felt. . . . the wind became so fearful & tyrannous that I was apprehensive, some of the stones might topple down upon me. So I groped my way further down, and came to 3 Rocks, placed in this wise each supported by the other like a Child’s House of Cards, & in the Hollow & Screen which they made I sate for a long while sheltered as if I had been in my own Study, in which I am now writing—Here I sate, with a total feeling worshipping the power & ‘eternal Link’ of Energy. The Darkness vanished, as by enchantment –: far off, far far off, to the South the mountains of Glaramàra & Great Gavel, and their Family, appeared distinct, in deepest sablest Blue—I rose, & behind me was a Rainbow bright as the brightest.—I descended by the side of a Torrent, & passed or rather crawled (for I was forced to descend on all fours) by many a naked Waterfall, till fatigued & hungry (& with one finger almost broken, & which remains swelled to the size of two Fingers) I reached the narrow vale, & the single House nested in Ashes & Sycamores –. I entered to claim the universal hospitality of this County; but instead of the life & comfort usual in these lonely Houses I saw dirt & every appearance of misery—a pale Wo[man] sitting by a peat Fire—I asked her [for] Bread & Milk, & she sent. a small Child to fetch it, but did not rise herself —. I eat very heartily of the black sour bread, & drank a bowl of milk—& asked her to permit me to pay her. Nay, says she—we are not so scant as that—you are right welcome—

but do you know any Help for the Rheumatics; for I have been so long ailing that I am almost fain to die.—So I advised her to eat a great deal of Mustard, having seen in an advertisement something about Essence of Mustard curing the most obstinate cases of Rheumatism—but do write me, & tell me some cure for the Rheumatism—it is in her Shoulders & the small of her back, chiefly—I wish much to go off with some bottles of Stuff to the poor Creature—I should walk the 10 miles, as ten yards
(*Coleridge Letters* 1: 630-4)

The fell climb exposing him to a storm of wind and hail, and leading him to act energetically in exhilarated response, is narrated like an experiment in breathing nitrous oxide or oxygen. The rheumatic woman confined to her cottage is all the more pathetic after his own aerated vitality is so intensely portrayed by the description of his rough and tumble descent of the fell.

Frozen Air

9. Darwin conceptualised atmospheres through the elastic medium of scientific poetry, while Coleridge interacted with winds and breezes in letters and poems (see “Dejection: an Ode”). Davy and others, however, turned away from this airy mixture of factual note and playful verse and from analogies that blurred observation and speculation. Instead, they aimed to measure air accurately, conforming to what Schaffer has shown to have been a post-1790s drive to gain for science the authority of objectivity (dissociating it from the enthusiastic theorising that led social conservatives to blame it for preparing the ground for the French Revolution). Aerial explorers, they took their instruments outside the laboratory, building on the work of Horace-Bénédict de Saussure, who used his eudiometer on the cols and summits of Europe’s highest peaks to measure whether “vital air” abounded there. Though Saussure found that altitude seemed to make no difference to the proportion of oxygen, he found that snow itself created a change. As he recorded in the seventh volume of *Voyage dans les Alpes*, the air evolved from the pores in the snow on the Col du Géant contained less oxygen than the atmosphere. Later climbers found similar results from the snow on Chimborazo, in South America. Perhaps, then, it was the preponderance of snow over vegetation, depleting oxygen, that gave cold regions their heady, dizzying effect on the body (rather than what we now call altitude sickness, owing to oxygen depletion at height).

10. It was to test this idea that the naval explorers sent to the poles by the Admiralty were charged with carrying out experiments, as well as searching for a northwest passage. When Captain William Parry’s third polar expedition returned to Britain in 1825 it brought a can of Arctic air to the laboratory at the Royal Institution. It was analysed by the professional man of science, Michael Faraday, who found that it did not meet norms. There was a “decided and constant difference between it and the air of London, of at least 1.374 per cent” (Silliman I: 199). This difference was attributed by some to the lack of vegetation in high northern latitudes. But they just did not know if the result was correct, nor if it was owing to the prevalence of snow or to the lack of vegetation—or both. The Arctic air could be recorded by the newly available technology, but not comprehended. Whether or not it justified the claims of the pneumatic vitalists as to the restorative powers of unpolluted, oxygenated breezes was not easy to determine.
11. The mysterious power of polar air became even more apparent in the narrative Parry published about the voyage. This recorded in detail the expedition’s efforts to subject the atmosphere to accurate, explanatory measurement:

A six-pounder gun was placed at the head of the bay, a distance of nearly thirteen thousand feet, or about two nautical miles, in order to ascertain the rate at which sound travels at different temperatures and pressures of the atmosphere. Our observations appear to indicate a decided decrease of velocity with an increased density of the atmosphere; the rate of travelling decreasing from one thousand and ninety-eight feet per second, at a pressure of 30.118 in. and temperature + 33.5°, to one thousand and fourteen feet per second at a pressure of 30.398, and temperature _38.5°; all other circumstances being alike. (Parry 58)

But all this experimental precision failed to account for polar air’s ability to confound expectations and to elude empirical measurement. Parry went on:

The extreme facility with which sounds are heard at a considerable distance, in severely cold weather, has often been a subject of remark; but a circumstance occurred at Port Bowen, which deserves to be noticed as affording a sort of measure of this facility, or at least conveying to others some definite idea of the fact. Lieutenant Foster having occasion to send a man from the observatory to the opposite shore of the harbour, a measured distance of 6696 feet, or about one statute mile and two-tenths, in order to fix a meridian mark, had placed a second person half-way

between, to repeat his directions; but he found on trial that this precaution was unnecessary, as he could without difficulty keep up a conversation with the man at the distant station. The thermometer was at this time — 18°, the barometer 30.14 inches, and the weather nearly calm, and quite clear and serene.

As befits a naval captain’s narrative, Parry’s account is dispassionate and empiricist. His recording of distance, air temperature and air pressure is a textual, as well as scientific, apparatus designed to establish reliability and to assure the reader that nature—the place explored—has been brought under the control of European knowledge systems. Mensuration matters, because it masters. Nevertheless, in one respect, Parry is flummoxed: in the Arctic air, sound may be measured but still defies expectations and confounds experience. Freezing on noses, lips and beards, the air was strangely tangible, but its graspable materiality was undone by its tendency to make the distant sound near and the strange familiar: what the voyagers heard contradicted the instruments. The air was full of noises.

12. Polar air defied the eye as well as the ear, as the whaling captain William Scoresby noticed in 1822. Scanning the horizon as he sailed off the coast of Greenland, he found his gaze fixed on a sight he knew he should not be seeing: floating in the sky was an upside-down ship. “It was,” he wrote, “so well defined, that I could distinguish by a telescope every sail, the general rig of the ship, and its particular character; insomuch that I confidently pronounced it to be my father’s ship, the *Fame*”—and this despite the fact that no ship was visible upon the water. “I was so struck with the peculiarity of the circumstance,” Scoresby noted, “that I mentioned it to the officer of the watch, stating my full conviction that the *Fame* was then cruising in the neighbouring inlet” (Brewster 137). Scoresby was correct: the airy phantoms not only resembled his father’s ship but, like the supernatural images seen by those with second sight, were premonitions of it. Scoresby senior’s ship subsequently appeared over the horizon, floating the right way up on the sea. The optical expert David Brewster was subsequently able to provide a geometrical explanation of this phenomenon but that did not remove its utter strangeness on the spot.

one *b*. The eye will now see through the convex lens *a* an *inverted* image of the ship at *S'*, and through the concave lens *b*, an erect image of the ship at *S''*, representing in a

Fig. 35.



general way the phenomena shown in Fig. 33. But it will be asked, where are the lenses in nature to produce these effects? This question is easily answered. If we take a tin tube with glass plates at each end, and fill it with water, and if we cool it on the outside with ice, it will act like a *concave* lens when the cooling effect has reached the axis; and, on the other hand, if we heat the same tube filled with water, on the outside, it will act as a *convex* glass. In the first case the density of the water diminishes towards the centre, and in the second it increases towards the centre. The very same effects are produced in the air, only a greater tract of air is necessary for showing the effect produced, by heating and cooling it unequally. If we now remove the lenses *a*, *b*, and hold a heated iron horizontally above the water in the trough *A B C*, the heat will gradually descend, expanding or rendering rarer the upper portions of the fluid. If, when the heat has reached within a little of the bottom, we look through the trough at the ship *S* in the direction *E S'*, we shall see an inverted image at *S'*, and an erect one at *S''*, and if we hide from the eye at *E* all

(Brewster, 149)

13. The Arctic, a place where day and night were months long, where the magnetic compass led one wrong, where icebergs loomed out of the fog without warning, remained a place of visual and sonic bafflement, full of airy nothings that materialized and disappeared without warning. To the explorers, trained in the empiricist culture in which mensuration was the means to establish objectivity and produce truth, the Arctic was frustrating but also fascinating because of its very resistance to that culture (see Beer, Moll, Picker). It became an uncanny place, a place where the very air eluded not only their eyes and ears, but also their best instruments. As such, it was the opposite pole not to the Antarctic, which remained unexplored, but to the laboratories and breathing chambers of Derby, Birmingham and Bristol, to the Pneumatic Institutions and Royal Institutions where the nature of the air and the effects of breathing it could be reliably comprehended by experimental science. Darwin was right: the atmosphere was different in the far north, but it was much harder for natural philosophers to explain that difference than he anticipated.

Shamans and Spirits

14. David Crantz the missionary to Greenland was not a natural philosopher. Yet he was trained as an empirical observer, a writer of reports whose plain unvarnished style was a token of their reliability. For him, the most disturbing aspect of the Arctic air was its ability to confound his empiricism. He discovered it could transmit the spirit gods of the Inuit, manifested as strange, travelling sounds made present by the shaman—the *angekok*. “After he has begun to sing,” Crantz wrote,

in which all the rest join with him, he begins to sigh and puff and foam with great perturbation and noise, and calls out for his spirit to come to him, and has often great trouble before he comes. But if the spirit is still deaf to his cries, and comes not, his soul flies away to fetch him. During this dereliction of his soul, he is quiet, but by and by he returns again with shouts of joy, nay with a certain rustling, so that a person who was several times present, assured me, that it was exactly as if he had heard several birds come flying first over the house, and afterwards into it. But if the *Torngak* comes voluntarily, he remains without in the entry. There our *angekok* discourses with him about any thing that the Greenlanders want to know.

Two different voices are distinctly heard, one as without, and another as within. The answer is always dark and intricate. (Crantz 209-11)

The Inuit shamans fascinated Crantz because he could not decode their method: he might call them conjurers but he could not work out how they summoned the spirits into sound and made the air come alive. “Nay the very air,” he declared, “is a vital essence, that may be kindled to anger by untoward actions, but yet is kind enough to admit petitioners to ask its counsel” (209). The Arctic was not a place of pneumatic healing, but one of aerial punishment and advice, achieved through a sonic materialization of morality.

15. Crantz observed shamans in Greenland in 1766; in 1797 an account of shamans in Arctic Canada was published. This was Samuel Hearne’s *A Journey from Prince of Wales’s Fort in Hudson’s Bay to the Northern Ocean*. Hearne was an employee of the Hudson’s Bay Company who in the early 1770s, led by a party of Cree and Dene, walked through the Canadian interior to the Arctic shore. The only white man in the expedition, Hearne was dependent upon his companions for survival, following their lifeways and directions rather than vice versa. From this position, he admired the power of shamans’ oral performances, revealing a society from which belief in the supernatural had not been banished in the name of science and civilization. Hearne detailed several incidents in which shamans mobilized the voices of spirits to curse their fellow tribe-members, who duly died. Coleridge, who was taught at school by Hearne’s friend William Wales (an astronomer who had himself sailed to the Antarctic on Captain Cook’s voyage of exploration) seized on these incidents in “The Three Graves,” the ballad he was to write jointly with Wordsworth. “I had,” he explained

been reading ... Hearne’s deeply interesting anecdotes of ... workings on the imagination of the Copper Indians ... and I conceived the design of showing that instances of this kind are not peculiar to savage or barbarous tribes, and of illustrating the mode in which the mind is affected in these cases. (Coleridge I: 269)

That the Arctic narratives should have become sources for Coleridge’s poetry might seem surprising, given his hopes for pneumatic healing and the notion that the science of airs was uncovering the dynamic “‘eternal link’ of Energy” by which the universe was activated. Crantz seemed to suggest, by contrast, that the northern air, making spirits manifest to the senses as strange sounds, effected the domination of one person’s imagination by another’s. In Hearne, air, materialized, became a means of spiritual enslavement and bodily destruction. Yet both writers did inspire Coleridge, because, I think, they crystallized in narrative form his underlying

fear that the optimistic science that he wanted to—and did—endorse presumed too blithely that pneumaticism could heal mind as well as body and thus redeem human nature.

16. By 1796 Coleridge was already haunted by an awareness of the hubris of the pneumatic science that he espoused: he attacked Darwin for arrogant atheism, criticized Priestley for pantheistic materialism, and rebuked himself, in his wife’s name, for the “unregenerate” and “Vain Philosophy” of such airy ideas as:

And what if all of animated nature
Be but organic Harps diversely framed,
That tremble into thought, as o’er them sweeps
Plastic and vast, one intellectual breeze,
At once the Soul of each, and God of all?

(“The Aeolian Harp,” 1796 text: 46, 49, 36-40; Coleridge 100-2)

In Crantz’s and Hearne’s depiction of the Arctic atmosphere, he found material through which he could portray a collective experience of the world that could not easily be comprehended by the new science—material that dramatized the explanatory limits of that science. That this material was terrifying did not make it any less powerful a reminder of its recalcitrance to being subsumed within the new philosophy of aerial and spiritual unity between humanity, nature and God.

17. In a 1794 poem Coleridge declared of the shamans “I deem these legends terrible, with which the polar ancient / Thrills his uncouth throng” (“The Destiny of Nations,” 90-91; Coleridge I: 134). It was in “The Ancient Mariner,” however, that he drew on Crantz and Hearne to dramatize the psychodynamics of entrancement and mental slavery. He brought the Arctic’s sonic uncanny home, so as to demonstrate the power of the irrational not just in the North or South Poles but also in supposedly enlightened and rational civilization. The mariner is a British shaman: like the angekok “he hath strange power of speech” and the wedding guest he addresses “cannot choose but hear” (1798 text: 620; 22; Coleridge II: 1030-48). What he hears is a story in which the sounds of the polar region configure the disturbance of the mind:

The Ice was here, the Ice was there
The Ice was all around:
It crack’d and growl’d, and roar’d and howl’d,
Like noises of a swound!

(57-60)

The tale-telling mariner has oral power like the shaman; his story restages Crantz’s description of the spirit that the angekok summons from the sea.

Under the keel nine fathom deep,
From the land of mist and snow,
The spirit slid: and it was He
That made the Ship to go.
The sails at noon left off their tune,
And the Ship stood still also.

(382-87)

Is this any more weird than seeing an upside-down ship in the air? Or than hearing a man who is over a mile away as if he were standing next to you? Or than listening to spirits in the air summoned by the angekok? The air of “The Rime” is polar air—an uncanny medium for the materialization of spirit wherein strange and far off noises resonate unexpectedly close to hand. The zombified crew, for instance, utter sounds that are their own and more than their own—sounds profoundly disturbing in their abnormality. They seem like shamans as they voice spirits who utter through, but are not circumscribed by, the body:

Sweet sounds rose slowly thro’ their mouths
And from their bodies pass’d
Around, around flew each sweet sound,
Then darted to the sun:
Slowly the sounds came back again
Now mix’d, now one by one.

(341-46)

Intriguingly, the elusiveness of these sounds is produced in visual terms—we see them flying like birds—although sound, obviously, is always invisible. By describing sounds thus, Coleridge asks readers to see what they have no possibility of seeing, thereby causing us to doubt both the separateness of the senses and their efficacy in comprehending the phenomenal world.

18. By the climax of the poem, sound is the chief mode through which the supernatural is naturalized, precisely because if it can be measured, measurement nonetheless does not comprehend its effects on the observer. The mariner is as overcome by its power as were the

Dene Indians in Hearne who, hearing the spirits voiced through the shaman, fainted and wasted away:

Under the water it rumbled on,
Still louder and more dread:
It reach'd the Ship, it split the bay;
The Ship went down like lead.

Stunn'd by that loud and dreadful sound,
Which sky and ocean smote:
Like one that hath been seven days drown'd
My body lay afloat...

(579-86)

If the sound stuns the mariner, the sound of his tale in turn stuns the wedding guest. In its turn the poem, a printed text pretending to the orality of the ballad form, stuns the reader. Coleridge creates a vicious sonic transference rather than an influx of healing air, and this places in doubt the pneumatic philosophy that descended from Priestley to Darwin and disturbs the assumption of institutional science—the assumption behind Parry's Arctic experiments, that accurate mensuration and dispassionate observation, discover fact. Superstitious minds and bodies, Coleridge suggests, experience the world in terms of fear, guilt and longing. What is believed by the superstitious is real—and readers, like the wedding guest, are placed in that position. Their/our experience—truth—is neither comprehensible to nor healable by a materialist culture that defines knowledge as what it can measure by instruments and model by experiment. The difference from *The Economy of Vegetation* is instructive: whereas Darwin sees speculation, or the playful entertainment of unlikely analogies and incredible scenarios, as a means of making innovative conjunctions that may lead to discovery—to new truths, Coleridge shows belief to be a matter not of play but of compulsion and conviction, transferred from self to self through narrative and locking—enthraling—all in a way of experiencing that produces a reality from which escape by enlightenment is almost impossible.

Science and Shamans

19. For at least some of those who portrayed the Arctic after Coleridge, the sound of the shaman became a key topos. George Lyon was in command of HMS *Hecla* during Parry's 1821-23 voyage of exploration. In the narrative he published of the expedition, he recorded his encounter with a shaman who summoned one of the spirits of the air in the form of a sound that moved into, around, and away from the ship:

suddenly the voice seemed smothered, and was so managed as to sound as if retreating beneath the deck, each moment becoming more distant, and ultimately giving the idea of being many feet below the cabin, when it ceased entirely. His wife now, in answer to my queries, informed me very seriously that he had dived, and that he would send up Tornga. Accordingly, in about half a minute, a distant blowing was heard very slowly approaching, and a voice which differed from that we at first had heard, was at times mingled with the blowing, until at length both sounds became distinct, and the old woman informed me that Tornga was come to answer my questions. I accordingly asked several questions of the sagacious spirit, to each of which inquiries I received an answer by two loud slaps on the deck, which I was given to understand were favourable. A very hollow, yet powerful voice, certainly much different from the tones of Toolemak, now chanted for some time, and a strange jumble of hisses, groans, shouts, and gabblings like a turkey, succeeded in rapid order. The old woman sang with increased energy, and, as I took it for granted that this was all intended to astonish the Kabloona, I cried repeatedly that I was very much afraid. This, as I expected, added fuel to the fire, until the poor immortal, exhausted by its own might, asked leave to retire. The voice gradually sank from our hearing as at first, and a very indistinct hissing succeeded: in its advance, it sounded like the tone produced by the wind on the base chord of an Eolian harp; this was soon changed to a rapid hiss like that of a rocket, and Toolemak with a yell announced his return. I had held my breath at the first distant hissing, and twice exhausted myself, yet our conjuror did not once respire, and even his returning and powerful yell was uttered without a previous stop or inspiration of air. (Lyon 359-60)

Despite his educated scepticism Lyon finds himself enthralled. The voices that utter through Lyon’s shaman, because they are seemingly without body yet inhabit a body not their own, call presence into question, as if what becomes manifest is the condition of all vocality as an unfixable mobility that moves through, but is not wholly possessed by, body. For an observer educated, like Lyon, in the scientific tradition, this voice is analogous to the Muse occupying the poet (vates), or the god occupying the prophet (Cassandra)—a matter of inspiration. In the moment it is experienced, however, it cannot simply be contained by analogy. Describing the experience at length, he reveals a fascination borne of anxiety about the ineffectiveness, in the Arctic, of European technologies for producing knowledge. The shaman brings to voice the persistence of a supernatural beyond the proliferation of technologies (mathematical, cartographical, experimental, statistical) that claimed to comprehend nature. As such he configures a fear and love that, buried at the heart of empiricist science, cannot speak its name.

20. It is perfectly possible that Lyon wrote of the shaman under the spell of Coleridge’s poem (he was a literate young man; explorers were motivated by fictions; “The Rime” had become renowned; his reference to an Aeolian harp suggests he may have read Coleridge’s poem of that name). It is even possible that his text was in dialogue with the talismanic Arctic fiction written in Coleridge’s wake. Mary Shelley’s *Frankenstein* (1818/31), citing both Darwin’s vitalist speculations (supposedly about animating vermicelli into life) and Coleridge’s “Rime”, turned the Arctic uncanny into a form that still haunts the Western cultural imaginary. At the end of the novel, as the creature and his creator chase each other across the frozen ocean, it is apparent that each is the double of the other—that they are not opposite (human to monster, rational to irrational, man of science to primitive) but alike. The Arctic is the place where this similarity is staged—where the opposition of scientific power to natural power, and of “knowledge” to superstition collapses and is seen to collapse. And it is the strangeness of the air, wrenched by shrieks, cracks, thunders and cries that may or may not be animate, that symbolizes this. The polar voyager Walton cannot tell what or whom he hears:

What do these sounds portend? It is midnight; the breeze blows fairly, and the watch on deck scarcely stir. Again there is a sound as of a human voice, but hoarser; it comes from the cabin where the remains of Frankenstein still lie. (Shelley: “Walton, in Continuation”)

Frankenstein, the Creature and the Ancient Mariner were new, anti-enlightenment figures shaped by and in their turn shaping what Arctic travellers guiltily half-revealed—that the

shaman was uncannily desirable as well as alien because his voicings declared the limit-point of scientific discourse’s explanatory power. This two-way textualization had consequences for real as well as for fictional voyagers and indigenes: making the northern Indian and the Inuit uncanny figures conditioned the way they were seen in twentieth-century anthropology as well as nineteenth-century literature (visiting scientists took far greater interest in shamans than, for instance, in Inuit women, and in ritual than in domestic work). In short, the textualization pioneered by Shelley and Coleridge, uneasy descendants of Darwin who replaced his playful employment of speculation as a means towards discovery, and his untroubled hybridisation of prose, verse, science and poetry, with nightmare narratives about the consequences of believing too strongly in the truth of what one thought one had observed, structured Romanticism in Britain. At the same time it romanticized—for both poets and scientists—the poles as zones of Otherness—the real/fantasy lands of articulated air about which those living within the textual horizon of scientific empiricism dreamed with fear and longing.

Works Cited

- Beer, Gillian. “‘Authentic Tidings of Invisible Things’: Vision and the Invisible in the Later Nineteenth Century,” in *Vision in Context: Historical and Contemporary Perspectives on Sight*, ed. Teresa Brennan and Martin Jay (London: Routledge, 1996), 83-98.
- Bravo, Michael and Sverker Sörlin (eds.). *Narrating the Arctic: A Cultural History of Nordic Scientific Practices* (Canton, Mass.: Science History Publications, 2002).
- Brewster, David. *Letters on Natural Magic: Addressed to Sir W. Scott* (London, 1832).
- Budge, Gavin. *Romanticism, Medicine and the Natural Supernatural: Transcendent Vision and Bodily Spectres 1789-1852* (Houndmills: Palgrave, 2013).
- Coleridge, Samuel Taylor. *The Poetical Works of S. T. Coleridge*, ed. E. H. Coleridge, 2 vols. (Oxford: Clarendon Press, 1912).
- . *The Collected Letters of S. T. Coleridge*, ed. E. L. Griggs, 6 vols. (Oxford: Oxford University Press, 1956-71).
- . *The Notebooks of S. T. Coleridge*, ed. Kathleen Coburn, 5 vols. (London and Princeton: Routledge and Kegan Paul and Princeton University Press, 1957-2002).
- Crantz, David. *The History of Greenland Containing a History of the Country and its Inhabitants*, 2 vols. (London, 1767).
- Daston, Lorraine and Peter Galison. *Objectivity* (New York: Zone Books 2007).
- Darwin, Erasmus. *The Economy of Vegetation in The Botanic Garden: a Poem in Two Parts Part I. Containing The Economy of Vegetation. Part II. The Loves of the Plants. With philosophical notes* (London, 1791).
- . *Zoonomia; Or, The Laws of Organic Life*, 4 vols. (London, 1801).
- Faraday, Michael. *The Correspondence of Michael Faraday*, ed. Frank A.J.L. James, 6 vols. (London: Institution of Engineering and Technology, 1991-2011), I.
- Fleming, Fergus. *Barrow’s Boys* (London: Granta Books, 1998).
- Hearne, Samuel. *A Journey from Prince of Wales’s Fort in Hudson’s Bay to the Northern Ocean Undertaken by Order of the Hudson’s Bay Company for the Discovery of Copper Mines, a North West Passage, &c. in the Years 1769, 1770, 1771, and 1772* (London, 1795).
- Klancher, Jon. *Transfiguring the Arts and Sciences: Knowledge and Cultural Institutions in the Romantic Age* (Cambridge: Cambridge University Press, 2013).

- Levere, Trevor H. “Measuring gases and measuring goodness,” in *Instruments and Experimentation in the History of Chemistry*, ed. F. L. Holmes and T. H. Levere (Cambridge: Cambridge University Press, 2000), 105-36.
- Lyon, George Francis. *The Private Journal of Captain G.F. Lyon, of H.M.S. Hecla, During the Recent Voyage of Discovery under Captain Parry* (London, 1824).
- Moll, Gerard. “On Captain Parry’s and Lieutenant Foster’s Experiments on the Velocity of Sound,” *Philosophical Transactions of the Royal Society*, 118 (1828): 97-104.
- Parry, William Edward. *Journal of a Third Voyage for the Discovery of a Northwest Passage, from the Atlantic to the Pacific, Performed in the Years 1824-25* (London, 1826).
- Picker, John M. *Victorian Soundscapes* (Oxford: Oxford University Press, 2003).
- Priestley, Joseph. *Experiments and Observations on Different Kinds of Air, Volume II*, 2nd edn. (London, 1776).
- Robertson, Lisa Ann. “‘Swallowed Up In Impression’: Humphry Davy’s Materialist Theory of Embodied Transcendence and William Wordsworth’s ‘Tintern Abbey’,” *European Romantic Review*, 26 (2015): 591-614.
- Saussure, Horace-Bénédict. *Voyages dans les Alpes précédés d'un essai sur l'histoire naturelle des environs de Geneve*, 7 vols. (Neuchatel, 1779-96).
- Schaffer, Simon. “Measuring Virtue: Eudiometry, Enlightenment and Pneumatic Medicine,” in *The Medical Enlightenment of the Eighteenth Century*, ed. A. Cunningham and R. French (Cambridge: Cambridge University Press, 1990), 281–318.
- . “Self-Evidence,” *Critical Enquiry* 18 (1992): 327-62.
- Shelley, Mary. *Frankenstein*, ed. Stuart Curran. A Romantic Circles Electronic Edition. 1831 text. <https://www.rc.umd.edu/editions/frankenstein>
- Silliman, Benjamin. *Elements of Chemistry: In the Order of the Lectures Given in Yale College*, 2 vols. (New Haven, 1830).
- Walford Davies, Damian. “Romantic Hydrography: Tide and Transit in ‘Tintern Abbey’,” in *English Romantic Writers and the West Country*, ed. Nicholas Roe (Basingstoke: Palgrave Macmillan, 2010), 218-36.
- Wilson, Eric G. *The Spiritual History of Ice: Romanticism, Science, and the Imagination* (Palgrave Macmillan, 2003).
- Wordsworth, William and Coleridge, Samuel Taylor, *Lyrical Ballads and Other Poems*, ed. James Butler and Karen Green (Cornell and London: Cornell University Press, 1992). Cited as LB.

¹ Schaffer points to the reaction against revolutionary ideas in the 1790s as the cause of a turn among experimentalists to seeking authority by stressing automatic registration of effects: results were independent of the experimentalists’ skill. Daston and Galison trace the rise of ‘objectivity’ as a marker of disciplinary authority, seeing it as firmly established in a gradually institutionalising ‘science’ by the mid nineteenth century.

² Klaner argues that disciplinary formation occurred through new institutions—such as the Royal Institution—which established disciplinary boundaries by running separate courses of lectures on discrete areas of knowledge.

³ On Darwin and the medicine of John Brown, see Budge.