Editorial

Histories of space and place are increasingly hot topics, so this issue features current research from trailblazers in the history of geography. Lachlan Fleetwood leads the way with an examination of the Himalaya as sites and subjects of 19th-century science (1), while Keith Lilley takes us out into the field to explore the archaeology of the Great Trigonometrical Survey of India (4).

Travelling further back in time, Kader Hegedüs examines the relationship between John Donne's poetry and Renaissance cartography (7), while Jason König and Dawn Hollis consider volcanoes in classical geographical and cultural landscapes (11).

Finally, Linda Andersson Burnett investigates Carl Linnaeus's interest in northern periphery exploration (13). We also have an interview with Manchester PhD student Erin Beetson (15), and notices of upcoming events (3).

This issue has been co-edited with Hazel Blair, who will take over as Viewpoint Editor next issue. Contributions should be sent to viewpoint@bshs.org.uk by 15 April 2018.

Hazel Blair and Alice White, Editors

Place and Space on High: Science in the Himalaya

Lachlan Fleetwood explores the science of mountains.

Few places have captured European romantic, imperial, and scientific imaginations more fully than the Himalaya. While exploring near the frontier with Tibet in 1821 in pursuit of these ends, East India Company surveyor Alexander Gerard found himself becoming increasingly paranoid:

Upon the surrounding heights near the Pass are many shughars or piles of stones sacred to the gods, and which at a distance exactly resembled men; and the instant my people observed them, they said they were the Tartars waiting for me; I thought the same, as they had a very suspicious appearance from below, and I could not divest myself of the belief (although the guides assured me that they were shughars) till I looked through the glass.

Fears assuaged by the deployment of his telescope, Gerard admitted some

ABOVE Section from Heinrich Berghaus’s Umrisse der Pflanzengeographie (1838). Mapping people, plants, animals, and fossils in three dimensions was essential to making the Himalaya into a unit that could compared with other parts of the vertical globe.

hopes of penetrating further into what was becoming one of the most pressing ‘blank spaces’ on European maps. These were quickly dashed, however, as he crossed the altitude sickness-inducing high pass only to meet a group of Tartars – real, this time, rather than imaginary – who had learned he was coming and were waiting to politely but firmly send him back to the lowlands. Moments like this are revealing of the limits of imperial mastery in the high mountains, while the shughars, which served as both waymark- ers and shrines, simultaneously remind us that these had long been lived and inscribed landscapes.

SITES OF SCIENCE

Recognition of the situatedness of scientific practice and attention to space and place is now ubiquitous in the history of science. Building on this, scholars have productively used geographical features like oceans, islands, and beaches as sites and scales for global histories of science, and to disrupt older national and area studies framings, though mountains have only recently begun to receive equivalently extensive attention.

In my current research, the high spaces of the Himalaya and their mountainous topography, social and cultural geography, and human and non-human dimensions are cast in protagonistic roles. In this article, I take the opportunity to outline some of the stories the Himalaya have to tell for the first half of the 19th century, when they were becoming both subjects and spaces of scientific practice.

Gerard’s conflation of shughars and border guards reflects the East India Company’s growing insecurity around the lack of knowledge of the vast and vertiginous mountains that made up their northern frontier. This ignorance, combined with growing concerns about Russian and Chinese activities on the other side of the mountains, saw the Himalaya take on the characteristics of cartographic ‘blank space,’ a rendering which was important not just in clearing away indigenous presences in preparation for European aesthetic and imperial appropriation, but also in compelling scientific exploration.

It was only in the 1810s that it was becoming acknowledged – first in India by lowly military surveyors, later (and not without some doubt and even outrage) by savants in Europe – that the Himalaya were, in fact, the highest mountains on the globe, far higher even than Alexander von Humboldt’s Chimborazo.

Just how much higher took some grasping. Commenting on a new type of

High mountain environments tested the relationships between instruments, authority and bodily performance.
thermometer for measuring altitude, one that had been tested on Mount Snowdon in Wales before being sent out to India, oriental scholar James Prinsep was exasperated to find that as the range of its scale ‘only extends to an altitude of 5405 feet, it is evidently quite insufficient for the traveller in India, who may ascend to 18,000 feet and still see Snowdons towering above his head.’

**ALTITUDE SICKNESS**

Accurately measuring altitude had not been especially important before the late-18th century, but was becoming essential to both imperial cartography and to sciences like biogeography and geology. Measuring the Himalaya was nevertheless a vexed business, not only because of inadequate and easily damaged instruments, but also because in high mountain spaces scale is difficult to judge and the senses are untrustworthy.

John Anthony Hodgson, one of the first surveyor generals of India, bemoaned that ‘whether it be from the changes in the atmosphere on high mountains, or the inconvenience of being exposed to severe cold & high winds, I find my observations never agree a fourth part so well as on the plains.’

While these spaces might ultimately have been less idiosyncratic than surveyors inevitably insisted they were, high mountain environments nevertheless tested the relationships between instruments, authority and bodily performance.

Alongside problems of scale and sensory derangement, the highest spaces were marked by physiological trials. In 1821, Alexander’s brother James Gilbert Gerard stood at 15,000 feet and noted that ‘the scene is therefore of unapproachable grandeur,’ a typical recourse to the picturesque and the sublime. He went on to describe the many and debilitating symptoms of altitude sickness afflicting him, concluding that he had ‘never experienced so decided a proof of the existence of an agent inimical to the principles of animal life.’ And yet, even as they were gasping for breath, other travellers found themselves marvelling at birds whirling lazily in the rarefied air above.

**LIVED LANDSCAPES**

Alexander Gerard noted elsewhere that ‘the Koonawures and Tartars estimate the altitudes of the passes, by the difficulty of breathing they experience in ascending them,’ a reminder that if these were uncertain spaces for early European explorers then they were, of course, coherent places to those who lived there. Spanning some 2,400 kilometres in a roughly crescent shaped band across Asia, the Himalaya are one of the most striking geographical features of our planet, though this scale would not necessarily have been meaningful or useful to those who who made their lives in the mountains. Here, even the idea of studying ‘the Himalaya’ as a space of scientific practice perhaps reflects vestiges of an older romantic, orientalist, and imperial fascination with Asia’s notoriously ‘mysterious’ and ‘exotic’ mountains – though these framings, too, have their histories.

Whatever the early tropes casting the Himalaya as impenetrable, they were – and long had been – highly porous. Extensive networks had operated within and through the mountains for millennia prior to European interest, and imperial science and exploration in the Himalaya advanced by following the routes and advice of residents, traders, migrants, and pilgrims.

Meanwhile, the Himalaya had also long been central to the imaginations of South Asians more broadly, holding key places in both Buddhist and Hindu cosmology, and playing, for example, important roles in the *Mahabharata* and the *Puranas*. The term ‘Himalaya’ has its etymology in Sanskrit, and is often translated as ‘abode of snow,’ a description that is nevertheless only intermittently apt given that vast swathes of the mountains are formed of high-altitude deserts.

As with James Prinsep’s reference to Snowdon, invoking other mountains was a standard trope, and travellers could not ascend the Himalaya without drawing on imperial networks to compare them, especially to the Alps and the Andes. Recognition that high mountains were commensurate environments meant that plants, people, and fossils increasingly had to be located on a globe that was vertical as well as round.

In imagining the Himalaya as whole, naturalists also adopted related frameworks of comparison, designating the various vertical zones as tropical, temperate, and arctic, and in turn subsumed the mountains into a global framework of European science. Only occasionally was it acknowledged that this language of latitude was being written over existing South Asian cosmologies, indigenous topographies, and other longstanding conceptions of space.

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**Visiting Fellowship: Oxford**

The Centre for the History and Philosophy of Physics (HAPP) at St Cross College, University of Oxford is able to offer one Visiting Fellowship a term for scholars coming to Oxford to carry out research on a topic in the history and philosophy of physics.

Visiting Fellowships carry full membership of the College with use of all its facilities and Visiting Fellows are required to be based in Oxford for the term in which they hold the position.

Details on how to apply can be found on the webpage: www.stx.ox.ac.uk/happ/scholarships-visiting-fellowships-and-prizes.

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**Exhibition: Ceaseless Motion**

The 17th-century physician and anatomist William Harvey spent his life researching circulation.

His experiments were revolutionary: blood was not ‘cooked’ in the liver, as had previously been thought, but circulated around the body from the heart.

A new exhibition at the Royal College of Surgeons in London dissects Harvey’s work, life, and legacy. *Ceaseless Motion* runs until 26 July 2018. See: www.rcplondon.ac.uk.

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**Notices**

**ESHS Conference 2018**

The 8th European Society for the History of Science (ESHS) Biennial Conference will be held in London from 14-17 September 2018.

The conference – which is being organised in conjunction with the British Society for the History of Science – will be held at University College London’s Institute of Education. The conference theme this year is ‘Unity and Disunity’. Registration will open on 1 May.


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Following in Everest’s footsteps: exploring the legacies of the Great Trigonometrical Survey

Keith Lilley uncovers the material remains of geodetic endeavour in 19th-century India.

Two hundred years ago, on 1 January 1818, the Great Trigonometrical Survey (GTS) of India was granted its official name. For over six decades, the GTS surveyors travelled India, meticulously and accurately measuring and surveying the subcontinent using a network of triangles. In 1856, using the surveyors’ observations as a basis, the height of the earth’s highest mountain was determined.

By 1871, their ‘geodetic’ framework was complete, and from it the detailed and systematic mapping of India was achieved. But these are not the only legacies of the GTS. Other enduring and tangible outcomes of this great enterprise are still visible across India – tall towers built by the surveyors to undertake their observations in the field for the purposes of their great trigonometrical survey. These ‘tower stations’, as the GTS described them, are an overlooked legacy of the infrastructure that underpinned the Survey of India’s detailed mapping of the subcontinent. The towers are important reminders of the huge scale of the GTS and its material impacts on the local landscapes traversed by the surveyors two centuries ago. While the history of the GTS is well-known through its historical archives and accounts, as yet its ‘archaeology’ is an underexplored field. Studying the fabric and form of the towers reveals valuable insights into the construction methods and techniques used by the GTS to create this infrastructure, which is otherwise largely neglected.

TEMPLES OF TRIGONOMETRY

The trigonometrical observations undertaken by the GTS relied on a network of survey stations. Some stations used hilltops, others used existing structures such as temples and semaphores, but in the flatter areas of the plains it became necessary to build bespoke towers on which to place the great theodolite (a precision instrument used for measuring both horizontal and vertical angles).

Such towers were constructed under George Everest while surveying the Great Meridional Arc north of Delhi in the 1840s. Everest noted the particular difficulties presented by this terrain and the need for survey towers to be constructed with an elevated platform for the theodolite.

In his Account of a Measurement of Two Sections of the Meridional Arc, published in 1847, he wrote:

“These edifices are of a square form at the base, and average about 50 feet in height, in some instances more and in others less. The wall at the bottom is 5 feet and at the top 2 feet in thickness, whence it appears that the interior is in mathematical language a portion of a square based prism, and the exterior a frustum of a square based pyramid.

By then, Everest had long-served the GTS, having succeeded William Lambton as superintendent in 1823, becoming Surveyor General of India between 1830 and 1843. During that time, the operational focus of the GTS was Kolkata (formerly Calcutta) and it was to here that Everest returned in 1830 following his sojourn in England after an illness contracted while surveying the Great Arc around Sironj.

At the time of his departure, Everest had left instruction for a team of experienced surveyors, including Joseph Olliver, William Rossenrode, Murray Torrick, and John Peyton, to complete a new series of trigonometrical observations extending eastwards from Sironj to Calcutta, a distance of 684 miles. Using a Cary 18-inch...
Alt-Azimuth theodolite instrument, the surveyors took six years to complete the work, from 1825 to 1831, resulting in the Calcutta Longitudinal Series. The network of the GTS was thus expanded eastwards across the Gangetic plains of eastern India.

This was difficult terrain to survey, but it was here that the GTS innovated in its approach to creating trigonometrical stations, largely because Olliver and his team struggled with their observations on the final approaches of the series as they neared Calcutta in December 1829.

**DESIGNING THE TOWERS**

The solution to the difficulties of surveying the flatter landscapes of West Bengal was to construct towers, the precursors of those Everest described and had built for the Great Arc in the 1840s. The towers’ original design owed much to the activities of the team of surveyors engaged with the Calcutta Longitudinal Series.

To the north-west of Kolkata, one of the towers constructed for the series still stands among the fields near Singur, at Bhola. The tall slender brick-built tower, described by contemporary sources as ‘a hollow rectangular tower 75.08 feet high,’ replaced an earlier tower constructed under Captain Bell, one of Olliver’s team-members, which had collapsed. Indeed, the initial survey towers built for the final sections of the Calcutta Longitudinal Series were ‘put up in rough fashion.’ However, on Everest’s return to India in 1830, the series advanced the final 60 miles to reach Calcutta, necessitating further discussion on the construction of the survey towers.

At that time, under Everest’s instruction,
two towers had also been constructed at the two terminals of the Calcutta Base-
line, set out on the Barrackpore Trunk Road in northern Calcutta in 1830-31.

Everest in particular is reported to have been ‘specially pleased with the two 75-foot towers built at the extremi-
ties of his base-line on the Barrackpore road by the Civil Architect, Mr Parker,’ the measurement of which formed a key element in the survey’s calculations. The scene was captured at the time by James Prinsep, whose drawing (right) shows one of Parker’s towers on the base-line as well as the instruments used in the precise measuring undertaken between the two terminal towers.

EVEREST AND PARKER

The twin towers of the Calcutta Base-
line are now in the hands of the Public Works Department in Kolkata, inscribed with a dedication to Everest. Parker, how-
ever, is rather forgotten, yet clearly it was his contribution (in building the towers in Calcutta), that formed the basis for other survey towers in West Bengal, such as the one at Bhola. Indeed, Parker’s was the model used by Everest for his towers of the Great Arc. Surveying Empires, a recent project funded by the British Academy, and led by Queen’s University Belfast, has revealed what remains of these monu-
ments to the GTS in the landscapes of West Bengal.

From the fieldwork carried out by the Surveying Empires project in 2017 in West Bengal, it is clear that Everest’s lega-
cies go far beyond the naming of the Himalayan peak. The GTS ‘tower stations’ that punctuate the landscapes of India provide a rich record of the survey prac-
tices employed under Everest. Revealed through these monuments is the mate-
riality of geodetic survey, which left its traces on the landscape.

Rather than representing a colonial vestige to be erased, what became clear through the project fieldwork is how far the GTS towers of West Bengal are valued by those living around them. Neverthe-
less, through rapid urbanisation and migration, India’s landscape is changing more than ever before, so these legacies of the GTS are under increasing threat.

Already, some towers in West Bengal have disappeared through urban redevelop-
 ment, while others, such as the tower at Samalia, south of Kolkata, are in urgent need of conservation. Raising wider national and international awareness of the heritage value of the surviving towers is a pressing concern, therefore, particu-
larly since these monuments represent such a significant contribution to the

history of science.

Careful study of the towers, including 3D imaging, has begun to show stylistic similarities and differences in the survey infrastructure of the GTS, with geographical and chronological variations evident in the design and construction of the trigonometrical stations.

A HERCULEAN TASK

While, outwardly, the GTS may appear a monolithic operation – in Everest’s words, ‘the most herculean undertaking on which any Government ever embarked’ – in its execution on the ground, as it

unfolded over the decades, the survey and its underpinning network of stations instead reveal a more fissured enterprise. These tangible legacies of the GTS in India are invaluable for what they contrib-
ute to our understanding of one of the most significant geodetic exercises of the nineteenth century, the Great Trigono-
metrical Survey of India.

For more on the Surveying Empires project, visit: www.surveyingempires.org.

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If John Donne (1572-1631) is better known for having claimed that ‘no man is an island’ (Meditation XVII, Devotions upon Emergent Occasions, 1624), he also argued that a woman might, in fact, be one:

License my roving hands, and let them go
Behind, before, above, between, below!
O my America! My new-found land!
My kingdom, safest when with one man manned!
My mine of precious stones! My empery!
How blessed am I in this discovering thee!

‘To His Mistress Going to Bed’, lines 25-30

This geographical metaphor, linking the female body to an uncharted continent being discovered – and claimed – by an avid explorer, is not unique in Donne’s poetry, and participates in the enthusiasm he shared with his contemporaries for the new geographies of the Renaissance. The names given by the explorers Christopher Columbus and Sir Walter Raleigh to new territories in the West Indies, such as the Virginian Islands and the Colony of Virginia, belong to this tradition.

But the geographical dimension of Donne’s metaphor here also has a cartographical resonance. Indeed, as Claude Gandelman has suggested, the passage cited above may very well be influenced by an extremely popular anthropomorphic map developed in the sixteenth century that, as its name Europa in forma Virginis suggests, associated the Old Continent with the shape of a virgin.

CREATIVE LICENSE

In the scope of my research on Donne’s spatial imagination, my interest in early modern maps grew as strong as Donne’s own. But more than his fascination for maps, what struck me most was his very sophisticated take on the close collaboration between cartographical and literary creation.

When Donne asks the woman/land to ‘license [his] roving hands’, not only is his character hoping for permission to uncover his mistress’s body, but Donne the poet is also seeking creative license for his own penmanship, so that he might
World maps witnessed major transformations in the early modern period. They had to be updated regularly to take new discoveries into account with increasing precision. But this did not preclude cartographers from producing aesthetically pleasing items.

**TOP** Oronce Finé, Nova, et Integra Universi Orbis Descriptio (1531).

**BELOW** Jodocus Hondius’s Vera Totius Expeditionis Nauticae (c.1595). Images: Library of Congress.
represent the landscape in whatever way he deems fit. His hand roves in and from all possible directions, searching for the most adequate way to map his coveted territory. This license is not only exploratory and colonial: it is also cartographical.

**MAPPING AND METAPHOR**

Donne, I believe, responds here to a particularly creative moment in the history of cartography, spanning from the late 15th to the late 16th centuries. While navigators and cartographers had to obtain official licenses from the authorities to launch expeditions and publish new maps – generally promising not to sell their works to competing countries – the new geographies also encouraged them to take liberties from established cartographic traditions and reinvent the grounds on which their maps were laid out.

World maps, in particular, witnessed major transformations. Rooted until then in the Ptolemaic tradition – a conic projected coordinate system of the then-known parts of the world – they had to be revisited in order integrate the latest terrestrial discoveries, including most of the western hemisphere. Added to the fact that it is geometrically impossible to transpose a three-dimensional object (the globe) into a two-dimensional plane without distorting its properties (areas, shapes, angles, and so forth), cartographers continuously experimented with new projections, compromising on one or other of these properties.

Martin Waldseemüller’s *Universals Cosmographia* (1507), the first world map to feature the name ‘America’, took the form of a truncated cordiform (heart-shaped) map, an equivalent projection preserving the areas of regions, except for the South Pole (which was left out).

Between 1500 and 1514, a ‘true’ cordiform projection was developed by Stabius and Werner, and was adapted by notorious cartographers such as Oronce Finé in his *Recens et Integra Orbis Descriptio* (1534). At around the same time, another cordiform map, known today as ‘the Bonne projection’, was designed by Bernardus Sylvanus (1511).

Two of the most influential cartographers of the time, Abraham Ortelius and Gerardus Mercator, not only reused some of these cordiform projections, but also contributed to the development of new ones. The Ortelius oval projection was, for example, named after Ortelius’s *Typus Orbis Terrarum* (1570), although this was largely based on a previous world map produced by Francesco Rosselli in 1508.

In 1569, Mercator published what would become – thanks to Edward Wright’s precise calculations in 1599 – an extremely useful navigational tool and the main projection used for rectangular world maps well into the 20th century.

The use of double hemisphere projections – showing the eastern and western hemispheres distinctively but conjointly – were also developed and became extremely popular at the time. Oronce Finé’s *Nova, et Integra Universi Orbis Descriptio* (1531) took the form of a double cordiform map (top left), while Jodocus Hondius, inspired by the works of Mercator’s son Rumoldus, popularised a double equatorial stereographic projection showing the two circular hemispheres conjointly, here (bottom left) in order to describe the circumnavigation of the world by the English explorers Sir Francis Drake and William Cavendish.

These two maps by Finé and Hondius are believed to have sparked two of Donne’s cartographical metaphors. As Robert Sharp noted in 1954, ‘The Good Morrow’ presents a couple of lovers facing each other and evoking, through the metaphor of two mirroring hearts, a double cordiform projection:

*My face in thine eye, thine in mine appears, And plain, true hearts do in the faces rest. Where can we find two fitter hemispheres Without sharp North, without declining West?*

‘The Good Morrow’, lines 15-18

Similarly, the eminent historian of cartography David Woodward has argued that Donne’s ‘Hymn to God, my God, in my Sickness’, which refers to the straits of ‘Anian, Magellan and Gibraltar’ (line 18) and insists on the idea that ‘West and East / In all flat maps (and I am one) are one’ (line 14), recalls Hondius’s division between eastern and western hemispheres as well as his clear depiction of the three straits along Drake’s route.

But Donne’s cartographical metaphors are more than simple allusions. They recreate in poetry the process through which early modern cartographers inspired their works from previous traditions and turned them into new worldviews. ‘On Love’s Progress’ is a particularly telling example:

*The nose, like to the first meridian, runs Not ’twixt an east and west, but ’twixt two suns; It leaves a cheek, a rosy hemisphere, On either side, and then directs us where Upon the Islands Fortunate we fall (Not faint canary but ambrosial), Her swelling lips, to which when we are come We anchor there, and think ourselves at home, ‘On Love’s Progress’, lines 47-54

While the overall association between navigational and bodily exploration recalls the *Europa in forma virginis* model, Donne in fact creates a new, hybrid, projection. The reference to the prime meridian excludes purely allegorical maps that are devoid of latitudinal and longitudinal gridlines. It does, as far as the nose is concerned, correspond to the fascinating *Fool’s Cap Map of the World*, an anthropomorphic truncated-cordiform map published anonymously around 1590, in which the first – and central – meridian indeed runs where the shape of a nose might be imagined, crossing the Canary Islands (for some time identified as the Fortunate Isles).

**DONNEAN CARTOGRAPHY?**

But Donne’s projection extends to the whole body: he continues his journey, later in ‘On Love’s Progress’, towards ‘The Sestos and Abydos of her breasts’ on both shores of the ‘Hellespont’ (lines 60-61), with the intent of ‘sailing t’wards her India’ (line 65) – her genitals. In other words, Donne took the liberty to imagine a new cartographic projection that we might call a *mundus in forma virginis*: a world map in which a head would be imprinted on the Atlantic Ocean, a chest on Europe, and the lower parts on Asia. Unfortunately, no such map has yet been discovered.

It is always very difficult to prove with certainty if Donne had actually seen the cartographic projections we have discussed so far, despite their popularity. Gandelman’s claim that the 1578 edition of Sebastian Münster’s *Cosmographia*, owned at some point by Donne, contained the *Europa in forma virginis* is inaccurate, as the illustration began appear-
ing only in subsequent editions. What we can be sure of, however, is that Donne was in one way or another sensitive to the manifold possibilities offered to scientists by the new geographies, and saw in this heightened cartographic license a new form of poetic license.

After all, the boundaries between science and poetry were, to say the least, blurred. The very first image of Europe as a robed figure published by Johannes Putsch in 1537 was accompanied by ‘Europa lamentans’, a poem reflecting on the poor geopolitical situation on the continent at the time. Similarly, Michael Drayton’s Poly-Olbion (1612-1622), a poetical work describing the topography of England and Wales, was accompanied by maps engraved by William Hole.

One of the most influential scientists of his time, Francis Bacon, pointed out in The Advancement of Learning (1605) that ‘Poesie [poetry] is a part of Learning in measure of words for the most part restrained: but in all other points extremely [sic] licensed’ (page 17). Donne seems to have been saying something similar about the new cartographies of the Renaissance.

**WORKS CITED**


The boundaries between science and poetry were blurred.
Fire and Fury: observing volcanoes in the ancient landscape

Jason König and Dawn Hollis explore the long history of fascination with ‘fiery mountains’.

The history of mountains and mountain-eering in the modern world is a popular topic these days. The usual story is that everything changed in the eighteenth and nineteenth centuries. Mountains had been viewed as places of fear and ugliness; now they were linked with beauty and the sublime, and treated for the first time as venues for leisure activity and adventure.

One of the goals of the project we are working on at the University of St Andrews is to challenge that narrative, partly by giving new attention to some of the continuities between ancient and modern responses to mountains. To what extent were the mountains of the ancient Mediterranean places of science? Was there a science of mountains in the ancient world?

There are many different answers to that question. Mountains loomed large in ancient ethnographic writing, which often drew causal links between the climate and landscape of particular regions and the character of their inhabitants. Mountainous peoples were often associated with primitive savagery and toughness. Mountains were also places of astronomy; Anaxagoras and Thales and other early Greek philosophers are said to have climbed up mountains to observe the heavens.

**EARLY SCIENTIFIC INTEREST**

But it was in their engagement with volcanoes that ancient scientists and philosophers came closest to modern scientific interest in mountains. They did not always give the same explanations as their postclassical counterparts, but many of the questions they asked were the same, and ancient habits of intense observation of volcanoes had a striking influence on later accounts, from the Renaissance right through to the nineteenth century.

One passage from the geographical writer Strabo even gives us a remarkable glimpse of a thriving tourist culture on Mount Etna:

**Near to Centoripa is the town of Aitna… which receives and escorts those who go up the mountain, for the mountain ridge begins there… The tops of the mountain appear to undergo many changes because of the distribution of the fire, which sometimes will cluster together in a single crater, but at other times divides itself, sometimes sending out streams of lava, sometimes flames and sometimes fiery smoke, and at other times ejecting red-hot stones.**

Strabo, *Geography* 6.2.8

**BELOW** Tourists at a lava stream running down from Mount Vesuvio. Plate 38 from William Hamilton, *Campi Phlegraei: observations on the volcanoes of the Two Sicilies as they have been communicated to the Royal Society of London* (1776). Image: Courtesy of the University of St Andrews Library (rff QE523.V5H3 plateXXXVIII).
He then relates a detailed account from acquaintances who have made the ascent. They report ‘a vertical cloud rising standing up to a height of about 200 feet, motionless (for it was a windless day) and like smoke,’ and they debunk the common story that the philosopher Empedocles committed suicide by jumping into the volcano, on the grounds that the wind and heat arising from the crater would have made it impossible for him to approach closely enough.

**FIERY MARVELS**

Side by side with that tradition of careful observation there is a much more visceral strand of ancient response to the wonder and horror of volcanoes. We see that powerfully in the anonymous Latin poem the *Aetna*, which was probably composed in the first century CE. The poet describes the power of the volcano in terms which anticipate the language of the sublime, in their stress on fear and awe:

> For very many marvels are visible on that mountain. On one side vast openings terrify and plunge into the depths. . . . Elsewhere thick cliffs block the path, and the confusion is enormous.

*Aetna*, lines 180-83

And yet even that response is not as far removed from scientific engagement as it initially looks, given that science and wonder were closely linked in the ancient imagination. Elsewhere the poet stresses the importance of using those reactions as a spur to investigation: ‘not just to gaze with the eyes like cattle…but to know the proof of things and to search into doubtful causes…that is the divine and delightful pleasure of the mind’ (*Aetna* lines 224-6 and 251).

The *Aetna* poet’s call – to visit, view, and meditate upon volcanoes in order to better understand the natural world – was enthusiastically followed by natural philosophers and travellers of the early modern period.

The Venetian humanist Pietro Bembo (1470-1547) was so amazed by the spectacle of Mount Etna that he completely disregarded the physical dangers of molten rock and flying stones. He also emphasized the need to observe volcanoes for oneself, and not merely to follow the writings of past visitors: ‘one learns in practice, and experience is as good an authority as Strabo, if he will forgive me saying so.’

The polymathic Jesuit Athanasius Kircher likewise got up close and personal with the reality of volcanoes. Stranded in the Gulf of Naples by an earthquake in 1638, he was delighted to have the opportunity to ascend Vesuvius, and found himself choked by the smoke and the ‘stench of sulphur.’

**SEATS OF PHILOSOPHY**

The volcano offered Kircher an omen of the end of the world, when God would destroy the Earth by fire. The prospect was terrifying but also wonderful: in the midst of the ‘horrible bellows and roarings of the Mountain,’ Kircher could not help but burst into praise for the ‘riches of the wisdom and knowledge of God!’ for creating such phenomena.

In the late 18th century, visitors to the Mediterranean drew on newly-refined tools and techniques of empirical measurement to understand volcanoes, but largely – and sometimes explicitly – followed in the footsteps of premodern and
Carl Linnaeus’s expedition to Sápmi in 1732

Linda Andersson Burnett investigates the work, life, and influence of a Swedish botanist, physician, and zoologist.

Carl Linnaeus (1707-1778) was, in his own words, ‘twenty-five years old, all but about a half day’ when he set off on Friday 12 May 1732 for what would become a three-month-long expedition to Swedish and Danish-Norwegian Sápmi (then referred to as ‘Lapland’). While the Swedish natural historian is today renowned for his classification of the natural world, in the 18th century he was also celebrated for this domestic expedition.

During his travels, Linnaeus covered an impressive 2,000 miles. Yet, in his report to the Swedish Royal Society for Sciences – which funded his expedition – his stated mileage was more than doubled to 4,500 miles. This deception stemmed, in part at least, from the fact that the society paid him by the mile.

DOMESTIC MAPPING

Linnaeus’s expedition was part of a nation-building agenda for harnessing the resources of the country through domestic mapping. The period was permeated by a cameralist belief that the great landmass of Sweden was a wealthy country waiting to be discovered and harnessed.

This Swedish cameralism was also a colonial project of surveying, opening up and controlling Sápmi – a contested land inhabited by indigenous Sami people (‘Laplanders’) – which stretched across the state borders of Sweden-Finland, Norway-Denmark, and Russia. The Swedish state hoped that by tying this territory closer to Sweden, it would increase both its landmass and national wealth. Besides taxes, there were natural resources of the region, such as animal skins, fishing waters, and minerals, including precious metals (silber having been discovered there in the early 1630s).

In order to successfully rule Sápmi, the state needed to increase its knowledge about the territory and its inhabitants. Linnaeus amassed a large number of observations on both the forest and mountain Sami that he encountered, meticulously noting how the Sami dressed, their appearance, their fishing and hunting habits, what plants they used, and what diseases affected them. Moving away from earlier depictions of the Sami, which had emphasised their alleged threatening pagan customs, Linnaeus depicted the Sami as inhabiting a primitive Golden Age of happiness, innocence, and health in the remote north of Europe. These primitivist statements were partly designed to provide didactic lessons to his metropolitan readers whom he deemed to be at risk of corruption by foreign goods and culture.

TRAVEL SOUVENIRS

Linnaeus brought back a number of Sami objects from his travels, including a boat, clothes, and a snuff box that he liked to show people. The walls of his house were adorned with Sami items he had collected, including a dress and dried flowers from his expedition. Preparing for his later travels to the Continent in 1735, Linnaeus packed a number of Sami souvenirs, including a shaman’s drum (given to him as a present following his expedition) and a full Sami costume.
Linnaeus's expedition, in particular, fascinated British naturalists and poets, who were at the forefront of disseminating and translated Linnaeus's *Lapland* narratives. While it did take some time for Linnaeus's taxonomy to take root in Britain, due to the strong adherence to the native classification system of John Ray, he was instantly admired for his expedition and for *Flora Lapponica* (1737), which the eminent naturalist and collector Hans Sloane regarded as ‘the best’ of Linnaeus’s works.

A brief visit to England in 1736 opened a door for Linnaeus to the British natural-history elite. When the Dutch naturalist Gronovius introduced him to the prominent botanist Philip Miller, he began by mentioning that Linnaeus had explored Sápmi:

Dear Sir,

I don’t doubt you have heard that the King of Sweden and the University of Upsal [sic] has sent a Gentleman to Lapponia to make observations there.

Johann Jacob Dillenius, the Professor of botany at Oxford, who was initially suspicious of Linnaean taxonomy, likewise referred to it when he explained who Linnaeus was in a letter to Dr Richard Richardson:

A new Botanist is arisen in the North, founder of a new method, on the stamens and pistils, whose name is Linnaeus… He is a Swede, and has travelled over Lapland. He has a thorough insight and knowledge of Botany, but I am afraid his method will not hold.

Linnaeus's descriptions of the Sami, and his expedition, were referred to in prominent texts such as Benjamin Stillingfleet's *Miscellaneous Tracts on Natural History* (1759); Richard Pulteney's *A General View of the Writings of Linnaeus* (1781); Lord Kames's *Sketches of The History of Man* (1774); Thomas Pennant's *Arctic Zoology* (1785-1787); and George Shaw's *General Zoology* (1800-1812). D H Stoever's biography of Linnaeus, appearing in English in 1794, likewise contained a lot of information about the expedition.

After his death, Linnaeus’s expedition diary was translated into English by James Edward Smith, the founder of the Linnean Society in London, under the title *Lachesis Lapponica or a tour in Lapland* (1811).

**SCOTTISH HIGHLANDS**

Linnaeus’s emphasis on northern peripheral exploration, in which all regions of a kingdom could be made productive (even those traditionally perceived as barren and dangerous), resonated particularly with British natural historians interested in the natural landscapes of the Scottish Highlands such as John Walker, Thomas Lightfoot, James Robertson, James Anderson, and Thomas Pennant. These natural historians modelled their Scottish expeditions and inventories on Linnaeus’s Sápmi journey and, in the case of Walker and Hope, taught Linnaean natural history at the University of Edinburgh.

Thomas Pennant wrote to Linnaeus in 1770 to inquire when a larger work on Sápmi, which Linnaeus had mentioned in *Flora Lapponica*, would be published. Linnaeus, who suffered from ill health during his last years, replied that it was now too late for such a work.

For those Britons who were eager to find out more about the region and its inhabitants, a small but growing number of British natural-history travelers, such as Matthew Consett and Edward Daniel Clarke, visited Scandinavia in the late 18th-century. There they followed in Linnaeus’s footsteps by visiting both Uppsala and Sápmi.

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**FURTHER READING**


Who or what first turned you towards the history of science?
I first encountered the history of science and technology through working with museum objects. I worked at Bolton Museum for over three years, which has one of the earliest industrial history collections in the country. I always found objects associated with the local textiles industry particularly fascinating. I brought together ‘star objects’ from the collection with modern material in the 2013 Textiles Treasure exhibition. I perhaps unwittingly encouraged some ‘heroic inventor’ narratives of Samuel Crompton, but it was always people’s stories of working in the industry and the social context of technologies that I found most compelling.

What’s your best dinner-table history of science story?
I clearly don’t attend enough dinner parties! I like to relay the story that the great ‘first’ of the opening day of the Liverpool and Manchester Railway was marred by the death of one its most prestigious advocates, William Huskisson. The irony of progress.

Which historical person would you most like to meet?
This is both a historical person and a historian: I would like to meet Professor Donald Cardwell. Cardwell was Chair in the History of Technology at the University of Manchester Institute of Science and Technology, and his determination to found a science museum in Manchester ‘to rival South Kensington’ led to the establishment of the Museum of Science and Industry. His archive is full of passion for the history of science and technology, and Manchester. I wonder what he would think of the Museum and the University today?

What has been your best career moment?
As a PhD student, my career is somewhat short-lived! I did really enjoy presenting a short talk at the Museum of Science and Industry on the 185th anniversary of the site in September 2015, which was apt because I was critiquing Liverpool and Manchester Railway ‘birthday’ events of the twentieth century for my thesis at the time.

And worst?
PhDs are taxing both mentally and physically (archive neck, anyone?), but it was always people’s stories of working in the industry and the social context of technologies that I found most compelling.

What are your favourite history of science books?
I find myself often returning to Christine MacLeod’s Heroes of Invention: Technology, Liberalism and British Identity, 1750-1914. I think MacLeod’s analysis of the veneration of inventors for economic, social, and political ends (for example, in anti-war campaigns) explains clearly why histories and objects of great inventors have been re-told and collected over the last century. This is also a very readable monograph, and I’m always looking for inspiration when it comes to academic style.

If you did not work in the history of science, what other career might you choose?
It has been a running joke amongst friends and colleagues of mine for many years that I want to be a ‘TV historian’. I did briefly appear on Great British Railway Journeys (another beetroot-red moment for me). But I’d prefer to work as a researcher in television. I’m very jealous of the QI Elves and the researchers of Horrible Histories. On a more serious note, I think improving access to higher education is crucial in the current climate, so I’d enjoy working in university access and engagement.

What would you do to strengthen the history of science as a discipline?
Public engagement is routinely performed by historians of science. I think better communication of the excellent work that already goes on is important in the current climate of anti-academic journalese. There is clearly also scope to improve our contribution to public history, and collaborations across disciplines and institutions such as museums is integral to this.

How do you see the future shape of the history of science?
I’d like to see a more diversity within the field both intellectually and professionally. I hope that all-male panels will become a thing of the past, and that in future we can better represent our global society. I know this is something the BSHS is committed to.

Would you like to suggest an interviewee?
Email us and tell us who we should speak to!
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