



THE
SPIRIT *of*
INQUIRY

*How one
extraordinary society
shaped modern science*



SUSANNAH GIBSON

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With a Foreword by Simon Conway Morris FRS

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To SLDF

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a glorious Phantom may
Burst, to illumine our tempestuous day.

England in 1819
Percy Bysshe Shelley

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FOREWORD

by Simon Conway Morris

There is much to be said for the understated, not least in the coinage of self-depreciation and getting things done without undue fuss. Such is the hallmark of the Cambridge Philosophical Society, whose history has remained largely, indeed unjustly, neglected. Now, thanks to the forensic skills of Susannah Gibson, the Society is placed in a remarkable new light, as both witness and participant in those momentous events that revealed entirely new worlds, those of organic evolution, deep time, and fundamental physics. So much is apparent from the Society's early days, when reports were received from Charles Darwin on his world-changing voyage, George Biddell Airy lectured on subjects as disparate as eye defects and pendulums, James Clerk Maxwell first addressed the Society at the age of twenty-two, J.J. Thomson spoke on the still mysterious cathode rays, and, to a packed house, Arthur Eddington outlined the sensational confirmation of Einstein's theories of space-time as the result of observations of how starlight was seen to be bent during a solar eclipse. This interval of little more than a century led to profound changes in our perspective. But it also opened some terrible possibilities. So it was that, as war spread across Europe, Rudolph Peierls, publishing in the Society's *Proceedings*, presented calculations that, with further refinement, led to the inexorable conclusion that a mass of enriched uranium smaller than a tennis ball could, in principle, annihilate a city.

From its establishment in 1819, the inspiration of its founders, John Stevens Henslow and Adam Sedgwick (along with Edward Daniel Clarke), was reflected in the Society, which was driven by a deep curiosity as to why the world is as it is, and how, with such knowledge, it might then be improved. With hindsight, this path to our modern world, where astounding discoveries are almost commonplace, reads as simple narrative—but

it was not so. Susannah is adept at showing how intricate and braided the actual story was, and, as importantly, how the situation both in the University of Cambridge and across the country was, on occasion, very far from propitious.

Near the end of her book, Susannah remarks how the ‘Society has [now] become just a small part of the vast landscape of Cambridge science—and that is the true mark of its success’; this is high praise indeed. Success, as is so often the case with English enterprises, lies in the genius of reinvention. In the case of the Society, it was sometimes involuntary. In the 1860s, looming financial catastrophe, largely the result of the egregious Mr Crouch, compelled a migration from its original home to a site that fortuitously made the Society a neighbour of the new Cavendish Laboratory. Here, as was repeatedly the case during its two-hundred-year history, the Society served as a vital catalyst in the epic developments of Cambridge science.

Susannah’s account reveals science as not only exhilarating but dotted with events and characters. Think of the crowds watching co-founder Clarke launching a hot-air balloon from Jesus College, as well as his arranging volcanic eruptions in his packed lectures. And what about Michael Foster’s distillation of noisome ‘excrementitious fluids’ in his laboratory that, strange to report, won him valuable bench space at the expense of his then neighbour, the Plumian Professor of Astronomy? In the wider field, the Society also repeatedly gained territory for the advancement of Cambridge science. Thus, it helped to win space for a new University Botanic Garden, provided the seedcorn for the now immense collections devoted to natural history, and, as importantly, provided the nucleus for the world’s finest scientific library (where, until its shameful closure, I spent endless hours pursuing my own research into evolution). So too, while the mantle of experimental expertise necessarily passed to the University departments, the Society pioneered the study of anthropometrics, thereby laying the groundwork for statistical rigour in biology.

Nor has the Society rested on its laurels. Recently, it inaugurated a scheme of Henslow Fellowships for gifted young scientists, and Susannah

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mentions the ongoing contributions of one recent and one current Fellow, Alex Liu and Emily Mitchell, in their studies of the dawn of animal life. So, the Society looks forward with confidence, but so too it looks back at its own initiation in 1819 as a turning point in Cambridge science. It may be a cliché that all scientists stand on the shoulders of giants (though less often is it remembered that this conceit goes back to at least the time of Bernard of Chartres), but it is no accident that the official seal of the Society is in the form of Roubiliac's celebrated statue of Isaac Newton. Located in the antechapel of Trinity College, this foundation (where a memorial to Adam Sedgwick is also to be found) as well as my own College of St John's (once home to John Henslow) played their own parts in the nurturing of the Society. Here, we join Susannah in saluting a remarkable institution which did, indeed, play its small part in the making of Cambridge science, but played it very well.

SIMON CONWAY MORRIS, FRS
President of the Cambridge Philosophical Society (2018–2019)

PREFACE

The Antikythera mechanism is one of the most extraordinary objects to survive from the world of ancient Greece. On this smallish fragment of metal, heavily corroded from centuries spent beneath the waves, the shape of a cross enclosed within a circle immediately catches the eye. It is clearly the work of a skilled craftsman; but what is it? It has been an object of fascination since its discovery in 1902, and modern scientific testing, using x-ray tomography and high-resolution surface scanning, have confirmed a long-held suspicion that the circles that appear over and over again in the body of the object were once an intricate system of gear wheels. There were more than thirty of these precisely cut brass wheels, and they were used to model the motions of the heavens. Whoever made this extraordinary device must have had a detailed knowledge of the movements of the celestial bodies, as well as astounding technical skill: the sophistication of the Antikythera mechanism was not matched for many centuries, when the first mechanical astronomical clocks were developed in China, and it was many more centuries before the technology reappeared in Europe.

The first meeting I ever attended of the Cambridge Philosophical Society was about this ancient machine. A packed lecture hall hung on every word of Mike Edmunds, Emeritus Professor of Astrophysics at the University of Cardiff, as he revealed the secrets of the device to us. His talk wove together archaeology, materials science, history, and cosmology. The Antikythera mechanism fundamentally changes the way we understand ancient technology; it can give us insights into the workshop of the Greek craftsman and into the mind of the Greek astronomer. Edmunds's study of it not only makes use of cutting-edge analytical techniques; it also provides an ideal example for explaining those techniques to a lay

audience. It is, in short, the perfect topic for discussion at a meeting of a philosophical society.

But what exactly is a philosophical society? Should an audience member be surprised to hear about metallurgical imaging techniques rather than Plato's idealism or Kant's metaphysics? It has long been a refrain amongst the Society's staff when talking to prospective members that 'the Society is not involved in philosophy, but in natural philosophy, which is to say science'. That is a neat summation of a series of complex terms which have had multiple different meanings throughout history; perhaps too neat?

The phrase 'natural philosophy' has ancient roots. It is often associated with Aristotle and his holistic study of the natural world. But, as the centuries wore on and Aristotle's work was reimagined in line with new Christian doctrines, natural philosophy grew into something else: a way of understanding the natural world as it was created by God. The subjects studied by natural philosophers were incredibly varied and included the sciences of motion and mechanics, the properties and qualities of matter, the art of astronomy, and more esoteric notions such as change, chance, and causes.¹

By the late seventeenth century, natural philosophy was evolving again. That is when Isaac Newton, working in Cambridge, published his most famous book—*Philosophiæ naturalis principia mathematica*, or, *The mathematical principles of natural philosophy*. This book did something quite unexpected: it merged abstract philosophical study with the precision of mathematics. For Newton, natural philosophy was still essentially a religious activity, one complementary to his strongly held views on theology, but the union of philosophy and mathematics would have a profound effect on the field. It made individual sciences such as astronomy broaden out, because now they did not simply deal with mathematical calculations, but were permitted to seek out the underlying causes of the phenomena they addressed; and it allowed philosophical arts such as studies of motion to become more precise as they turned from qualitative to quantitative.²

Some people speak of this period at the end of the seventeenth century as a 'scientific revolution', the point at which natural philosophy ceased and modern science began. But, in reality, natural philosophy lived on for many years. In the eighteenth century—the century of Enlightenment—natural philosophy remained a broad art. More than that, it began to draw in a broader spectrum of participants. The Enlightenment ideal of egalitarianism meant that ordinary people were being exposed to aspects of culture (be they artistic or scientific) that would previously have been closed to them. The seventeenth century had seen the creation of a new entity for the elites—the scientific society—and now, in the eighteenth century, there was growing demand for similar societies to cater to the general populace. In London, the Royal Society (founded in 1660) had been the centre of elite natural philosophy for over a hundred years but, from the late eighteenth century, two new kinds of organization began to grow up. First, based in London, were the specialist scientific institutions, which catered for single subjects like natural history, geology, and astronomy. Then there were the provincial societies.

These provincial societies, usually based in industrial towns such as Manchester, or fashionable spa towns such as Bath, often styled themselves as 'literary and philosophical', reflecting the societies' intention to introduce their members to a wide span of knowledge across the arts and sciences. But that was not all the societies did—the original concept of natural philosophy as a sort of spiritual or moral experience was as relevant as ever: for example, the founders of the Literary and Philosophical Society in the northern town of Halifax, a centre of wool manufacture, hoped that they would encourage 'a taste for scientific and other liberal pursuits, which may serve to elevate the intellectual and moral character, and thus to promote . . . the best interests of mankind'.³ The societies were an instant hit and audiences flocked to their grand new lecture halls to hear about all the marvels of the era: electricity and steam power; the powerful new machines of the industrial age; advances in medicine; and explorations of new lands; but also about poetry, music, and fine paintings. Membership of the provincial societies grew rapidly and,

alongside their new lecture halls, the societies built museums, libraries, and classrooms. The societies were true Enlightenment institutions.

The Cambridge Philosophical Society, which was founded in 1819, is part of this same tradition, and yet it stands apart. For one thing, it was the only such society to be founded in an English university town and, though it was officially independent, the Society and the University had an intimate relationship. For another, membership was only open to former students of the University of Cambridge, which meant (as we shall see) that every single fellow of the Society had a thorough grounding in mathematics, for no one was permitted to graduate without knowing his Newton. Perhaps this is what distinguished the Cambridge Philosophical Society from its sister societies across the country: while the provincial societies devoted the main part of their energies to natural history and the more descriptive sciences, the Cambridge Philosophical Society became increasingly mathematical in its early years. This meant that it aligned itself with the nineteenth-century trends of specialization and mathematization, especially in the physical sciences. While members of the provincial societies favoured talks on travel, were most likely to borrow novels from their libraries, and often focused on education over original research, the fellows of the Cambridge Philosophical Society relished talks on the calculus, built up one of the most impressive scientific libraries in the country, and actively sought to create *new* knowledge.⁴ The Cambridge Philosophical Society was perfectly poised to be part of the campaign to create what we now think of as ‘science’.

This history has been conjured from a small archive the Society has preserved, which was catalogued for the first time in 2014 as part of the preparations for the Society’s bicentenary celebrations in 2019.⁵ I am the first historian to systematically examine the archive since it was catalogued.⁶ Not knowing where to begin when faced with a wall of identical grey archival boxes, I opened the uppermost box and found an old red Oxo tin, rusting around the edges and declaring itself the bringer of ‘meatier meal times’. Tied to the outside of the box was a soot-blackened metal

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ladle, while inside rolled a handful of red wax balls, which were the size and shape of holly berries, along with the stump of a candle, a few spent matches, and the old seal of the Society. These simple objects instantly transport the viewer back to the early days of the Society. They are a rare material link to its past and a first step to unravelling its complex history.

From that archive, sometimes frustratingly incomplete, I have tried to tell a story which has often been lost in the bewilderingly rich history of Cambridge. It is a story that is much bigger than it may first appear, for understanding the history of the Cambridge Philosophical Society gives new insights into the history of science both in the city and, more widely, in Britain, Europe, and the rest of the world. It gives us a new understanding of how Cambridge came to be what it is and of how science developed from being a peripheral activity undertaken by a small number of wealthy gentlemen to being an enormously well-funded activity that can affect every aspect of our lives.



Plate 1 A selection of objects from the Woodwardian Cabinet.



Plate 2 John Stevens Henslow's geological map of Anglesea (Anglesey) in North Wales, from his first scientific paper, which was presented to the Society in November 1821 and published in 1822.



Plate 3 Cambridge observatory, showing the director's apartments in the east wing (c. 1829).



Plate 4 *Disa cornuta*, an African orchid, from *Flora Herscheliana*, Margaret and John Herschel's joint project to record the plant life of South Africa.

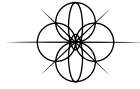


Plate 5 An image of the New England Cutting, near Brighton, showing crowds gathering to celebrate the opening of the line in the early 1840s.



Plate 6 John Crouch (seated, far left) with the town and gown cricket clubs (1847).

THE FENLAND PHILOSOPHERS



From the tall chalk cliffs south of Alum Bay, you can see clear across the water to the northern shore, where coloured bands of stone stripe vertically above the beach. Reds, pinks, greys, and browns, veined occasionally with white: these ancient rocks jut out harshly beneath the green curves of the land above. Like a skeleton exposed, the sheer cliffs reveal the hidden workings that lie under ground, usually out of sight. You cannot understand the skin of the land without understanding its bones, its muscles. Scrambling down the rocks, one bright April day in 1819, two young geologists hoped to do just that—understand.

Adam Sedgwick and his friend John Stevens Henslow had come to the Isle of Wight to see these extraordinary vertical beds (see Figures 1 and 2). At the base of the cliffs, in the curve of the bay where the chalk gives way suddenly to darker rocks, they used their hammers to crack open the earth. The rocks here were rich in clay, and rich in fossils. Sedgwick and Henslow found ancient oysters, the long, elegant shells of *pinna*, two kinds of bivalve, and one of univalve. They examined the specimens carefully, chipping away at the matrix that had held them for so long, turning them over in their hands, comparing them to similar species. But what did these fossils mean? The same collection of fossilized shells was known to exist in another kind of rock, the so-called London Clay. Was this the same rock, far from the other known outcrops, or was it mere coincidence that the fossils matched? Sedgwick and Henslow tried to picture the world as it had been when the rocks were formed—perhaps millions of years earlier: they conjured a tranquil sea that was shallow, warm, and filled



Figure 1 Adam Sedgwick in his 40s, wearing full academical dress in his role as Woodwardian Professor (1833).



Figure 2 John Stevens Henslow in his 50s when he was Professor of Botany (1849).

with living things. Now, the only evidence for that earlier world was the rock face in front of them with its scattered fragments of preserved shells.¹

This was Henslow's first foray into field geology, and Sedgwick's second. Geology was a young science; born in the second half of the eighteenth century, it was growing quickly in the first decades of the nineteenth. This

new science aimed to unlock the secrets of the past by examining the present-day world. If Sedgwick and Henslow could understand the make-up of these rocks, they might be able to figure out how they had been created, what the landscape had been like at the time of their creation, and whether there had ever been a physical link between them and the London Clay. Their fieldwork was slow and methodical: partly to ensure that their data would be reliable and partly because both were just learning the methods of their new science. Henslow had lately completed an undergraduate degree at the University of Cambridge and was determined to learn as much about the natural sciences as possible.² Sedgwick had a more pressing reason for learning the techniques of geology: he had recently been appointed Woodwardian Professor of Geology at Cambridge but knew next to nothing of the subject.

Sedgwick was an intelligent and able man. He had been born in 1785 in the village of Dent, which was in the northern English county of Yorkshire and was where his father Richard Sedgwick was the local vicar and schoolmaster. Adam studied under his father until he was 16, and then attended the grammar school in nearby Sedbergh before finally spending a summer being tutored by the legendary John Dawson. Dawson had begun life as a shepherd in the Yorkshire Dales but somehow developed an interest in mathematics. He used wool spun from his flock to knit stockings, and he used the money earned from selling these to buy mathematical textbooks. Dawson was an entirely self-taught mathematician but he soon became competent enough to start teaching pupils of his own. Richard Sedgwick had been one of Dawson's earliest students, and so it was natural that Richard sent his son Adam to him to learn the mathematics needed to earn a place at Cambridge. Dawson had, since the 1780s, come to specialize in preparing boys for their studies at Cambridge, and a staggering number of his former pupils went on to be awarded top marks in the University's examinations.³

After a summer studying under Dawson, Adam Sedgwick won a place at Cambridge. In the early nineteenth century, Cambridge University was primarily a religious training ground which supplied clergy to the Church

of England, though it also offered a broad education to boys who came from reasonably wealthy families or were clever enough to win scholarships. There were two parts to the system: the colleges (seventeen of them when Sedgwick arrived) which were autonomous bodies run by fellows with responsibility for the education, bodily welfare, and spiritual guidance of their students; and the University, which was a small administrative body mostly concerned with examinations and the awarding of degrees. At the time, there were only two universities in England: Cambridge and Oxford (compared to five in Scotland). Both of the English universities were conservative Anglican institutions that were closed to most of society: women, Catholics, Jews, and members of the dissenting Protestant churches were barred from entry.

Sedgwick was accepted into Trinity College in 1804 as a sizar—the name given to a poorer student who paid reduced fees in return for performing chores around the college. He travelled the couple of hundred miles from the rolling green hills of Yorkshire to the vast flatness of Cambridgeshire in a ‘six-inside’ stage coach, a journey that took three days and two nights and which Sedgwick later recalled as being utterly dismal.⁴ This was the furthest Sedgwick had ever travelled from home. When he reached Cambridge and entered Trinity College—the largest, wealthiest, and most powerful of the colleges that made up the University—he found a world unlike anything he had known before. The black-gowned figures of Cambridge, the strange jargon they used, and the countless unspoken rules were a mystery to him. Many of his fellow students came from wealthy and privileged families; they had moved in fashionable circles, they had travelled, and they had cultivated the manners of gentlemen. For affluent students, Cambridge could be a place of great decadence: ‘wine-parties’ were popular student events at which ‘pine-apples and preserved fruits of all sorts, and ices in varied columns’ were served and ‘frivolous youths seem to vie with one another in the multiplicity of their wines. Champagne and claret are now considered almost indispensable.’⁵ To such students, Sedgwick appeared uncouth and provincial: he wore out-of-date clothes, displayed unsophisticated manners, and spoke with a thick

Yorkshire accent. But he had a quick mind and a boyish animation; he charmed his peers and soon found himself settling into college life.

Sedgwick did well academically. He was placed in the top few students in the summer examination of his first year, something which required in-depth knowledge of the classics as well as of mathematics. The examination was a *viva voce*—a spoken test—held in front of the master and senior fellows of the college in Trinity’s great hall. Lord Byron, a contemporary of Sedgwick’s at Trinity College, remembered the particular terror of this experience:

High in the midst, surrounded by his peers,
MAGNUS his ample front sublime uprears;
Plac’d on his chair of state, he seems a God,
While Sophs and Freshmen tremble at his nod.
As all around sit wrapt in speechless gloom,
His voice, in thunder, shakes the sounding dome;
Denouncing dire reproach to luckless fools,
Unskill’d to plod in mathematic rules.⁶

Sedgwick continued to impress his teachers over the next few years—even a bout of typhoid fever in his second year did not derail his progress. He devoted himself wholeheartedly to his studies, ignoring the many distractions open to an undergraduate, as a letter from his dear friend William Ainger shows:

How possibly can you, deeply immersed as you are in all the sublimities of Mathematical Science, take any interest in the grovelling concerns of one who, since he left you, has merely been scampering about the Fens in order to get rid of time? In truth, Sedgwick, had I anything more important to acquaint you with, I would not presume to inform you that last Tuesday sen’night I was capering at Wisbeach to the sound of a Fiddle, and that the deepest speculation in which I have engaged, has been an attempt to learn the character of an eccentric girl whom you may recollect I once mentioned as the only female likely to make an impression on your iron heart. Positively I think her as great an oddity as yourself; and surely this is saying enough to excite any one’s curiosity who is not so much infected with the Mathematical Mania as to scorn everything which is lower than the stars.⁷

Sedgwick's mathematical mania drove him to stay diligently in his rooms, shunning the delights of fiddle music and young women. Instead, he rose each morning at 5 a.m. and worked late into the night, reading the assigned texts until he was overtaken by sleep—sleep that was disturbed by 'the most horrid dreams you have the power of conceiving' as mathematical symbols and philosophical concepts danced through his exhausted mind.⁸ But Sedgwick's sleepless nights paid off when he was awarded a scholarship in his third year.

In 1808, Sedgwick took his final examinations—known in Cambridge as the Tripos, after the three-legged stool on which students had traditionally sat while undertaking them—and was placed fifth in the University. Then he faced a decision: to try for one of the small number of fellowships in Cambridge; to train for the bar or the church; or to return to rural Yorkshire to become a schoolmaster. Sedgwick had little real interest in legal matters, struggled to apply himself to theological studies, and, having tasted the delights of university learning, could not bear the idea of returning to the staid life of Dent, and so he determined to become a fellow.⁹ After two years sustaining himself in Cambridge by taking on private students, Sedgwick finally won a fellowship at Trinity College in 1810.

The fellowship gave Sedgwick an income, rooms in college, and security, but it also deprived him of much. College fellows at that time could not marry, and so Sedgwick committed himself to a life of celibacy for as long as he held the fellowship. He joked that 'marriage may be all well enough when a man is on his last legs, but you may depend on it that to be linked to a wife is to be linked to misery. From the horrid estate of matrimony I hope long to be delivered.'¹⁰ Yet, Sedgwick did once come close to marrying. He still dwelt upon his former sweetheart as he neared his seventieth birthday, reminiscing to his niece how once in his youth 'I was a dancing-man, and I fell three-quarters in love; but, as you know, did not put my head through love's noose'.¹¹

But Sedgwick's fellowship kept him busy, and he had little time to think of love. In-between the daily routines of college life—attendance at chapel, meals in the draughty hall, tea in the combination (i.e. common)

room—his duties mainly involved tutoring undergraduates. In Cambridge at this time, mathematics formed the core of the curriculum, so Sedgwick spent his days in cold stone buildings, wrapped in an academic gown, drilling sums into ungrateful students. He found the work burdensome and had to work long hours to keep up with the demands made upon him. His health began to break down under the strain of the work and of his own despondency. But things started to look up from 1815, when Sedgwick was appointed Assistant Tutor at Trinity. The position came with a small pay rise which allowed Sedgwick to spend the University vacation travelling on the continent. For four months, he toured through France, Switzerland, Germany, and Holland. Much of Europe had been closed off to British travellers during the Napoleonic Wars that had raged until 1815, and Sedgwick leapt at the chance to visit these lands about which he had heard so much.

Sedgwick's notes from his first visit to continental Europe are terse, and serve mainly to highlight his dislike of the French: 'the beautiful, gay, and profligate city of Paris is a noble capital,' he admitted, 'but the people are so abominable and detestable that there can be no peace for Europe if they are not chained down as slaves, or exterminated as wild beasts.' Still, Sedgwick's mood improved as he crossed into Switzerland and beheld the majestic Alps for the first time. The mountains left him stunned; their beauty exceeded anything he had previously imagined and their 'exquisite perfection' would remain in his memory long after he had returned from their lofty peaks. He travelled through mountains and forests, saw glaciers for the first time, and picked his way across new lands with only the sun and stars to guide him.¹²

The trip was a revelation for Sedgwick and, after his European adventures, his health improved greatly. He realized that he needed more than the repetitive grind of mathematics tutorials in insular Cambridge. He began to spend more time outdoors, returning to Yorkshire whenever he could; he began to think of studying subjects beyond mathematics. He wished to travel, to see new things, and to stimulate his intellect. And so, when the Woodwardian Chair of Geology became available in 1818, Sedgwick decided to apply for the post.

The Woodwardian Chair had been established in Cambridge in 1728 by John Woodward, a physician who was fascinated by fossils. Woodward had written some of the earliest manuals about how to collect and preserve geological specimens; indeed, many of his instructions are still followed by geologists today. Woodward had used the specimens he gathered as evidence to back his theories of how the earth had formed, trying to link biblical accounts of a flood with physical evidence from the rocks. While many seventeenth- and eighteenth-century naturalists tried to create such theories, their theories were not necessarily rooted in the real world and few engaged in active fieldwork as Woodward did. Upon his death, Woodward left his collections, meticulously arranged in cabinets, to the University of Cambridge¹³ (the ‘Woodwardian Cabinet’; see Plate 1). He also left enough money to endow a professorship in geology, the first of its kind in Britain. The professor’s duties as outlined in Woodward’s will would be slight: the professor had to look after the collection and give four lectures each year.

Ever since Adam Sedgwick had arrived in Cambridge, the Woodwardian Chair had been held by the same man: John Hailstone. Hailstone had studied briefly under the famous German geologist Abraham Werner; back in Cambridge, he became an active collector of mineralogical specimens and did much to expand Woodward’s original collection. The previous Woodwardian chairs had not been known for their lectures. This, explained Hailstone, was because geology, unlike botany and zoology, ‘consisted of a few scattered unconnected facts, incapable of being digested into a system. And what is incapable of being reduced to a system cannot be made the subject of public instruction.’¹⁴ Though he had intentions to rectify this, he seems not to have lectured very widely or regularly during his thirty years in the post, but he did share his geological knowledge through displays of his specimens and tours of the Woodwardian Cabinet. It came as a surprise to many when Hailstone announced his resignation of the post in 1818. The reason? He wished to marry, and the terms of Woodward’s bequest demanded that the professor be a bachelor.¹⁵

Following his wedding, Hailstone moved with his bride Mary to the vicarage of Trumpington, just outside Cambridge, leaving the geology chair

unfilled. This was just the opportunity Adam Sedgwick had been waiting for. He was heard to complain that he was ‘heartily sick’ of the tedious work of tutoring undergraduates in mathematics; he needed a new challenge. When he learned that Hailstone was to step down, he wrote excitedly to a friend of his hopes of attaining the post: ‘if I succeed I shall have a motive for *active* exertion in a way which will promote my intellectual improvement, and I hope make me a happy and useful member of society.’¹⁶

Several candidates put themselves forward for the chair. One, George Cornelius Gorham, a fellow of Queens’ College, had even studied geology and was known to have a good working knowledge of the subject. But Sedgwick, hailing from a larger and more powerful college, won the vote—a triumph of ‘influence against qualification’ according to Gorham who also complained, probably accurately, that some had voted against him because he was a Methodist.¹⁷ The fact that Sedgwick knew little about geology seemed hardly to matter to those who voted for him.

For what it was worth, Sedgwick had sat in on a few lectures by the mineralogy professor, Edward Daniel Clarke, and read a little about geological theories, but really his appointment to the Woodwardian Chair was on the strength of his character, his connections, and his general abilities.¹⁸ This was not unusual at the time, and the University seemed little concerned by its new professor’s lack of qualifications. Professors were not necessarily expected to lecture on their subjects. But Sedgwick planned a different approach: he would be a practical geologist; he would lecture weekly; he would lead his students on field trips; and he would collect widely and expand the University’s small geological museum.

Sedgwick had had no choice but to devote himself to mathematics in the first years of his career: it was the only way to win scholarships and fellowships at the University. Sedgwick’s family was not wealthy enough to support him in an independent career, so he had used mathematics as a means to an end. But the toll it had taken on his health and mental well-being was a heavy price to pay. The many hours cooped up inside, reading late into the night by dim candlelight, had left Sedgwick craving an outdoor pursuit. Accepting the Woodwardian Chair meant a pay cut

for Sedgwick, but he didn't mind so long as he could free himself from the drudgery of teaching undergraduates the same mathematical problems over and over, do something that stimulated his mind, and spend more time outside the lecture room.¹⁹

The Woodwardian Chair had never had such an active incumbent. As soon as he was appointed in 1818, Sedgwick began his research. He spent that summer in the lead mines of Derbyshire, the copper mines of Staffordshire, and the salt mines of Cheshire. Fearlessly, he descended into the pits, lowering himself down the precarious wooden stemples until he was hundreds of feet below the surface of the earth. He followed the mineral veins and examined the rock strata; he began to learn the secrets of the land. And he launched himself into a frenzy of collecting, so that, when he returned to Cambridge in the autumn, every table and chair in his room overflowed with the spoils of the summer.²⁰ Sedgwick's first lectures began to take shape. It was at this time that he planned that trip to the Isle of Wight with his friend John Stevens Henslow, determined to see the reported vertical beds at Alum Bay for himself.

Sedgwick and Henslow had met some years earlier, through a mutual friend, John George Shaw-Lefevre, who had come up to Cambridge in the same year as Henslow and had studied at Trinity College, where Sedgwick was a tutor. Though ten years apart in age, Sedgwick and Henslow quickly developed a warm friendship. In January 1819, Sedgwick began his first lecture course in Cambridge, a lecture course which Henslow (though no longer a student) eagerly attended. He was greatly impressed by Sedgwick's eloquence and zeal, and much impressed by the science of geology which Sedgwick carefully and engagingly explained to his audience (an audience made up not just of members of the University but also of townspeople, including women, whom Sedgwick enthusiastically welcomed into the lecture room). Henslow, who already had an interest in mineralogy, found the young science of geology thrilling—revealing, as it did, aeons of history in the shape of a landscape.²¹ And so, at the end of the lecture course, when Sedgwick proposed to Henslow that he join him on a field trip to the Isle of Wight, Henslow jumped at the chance (see Figure 3).

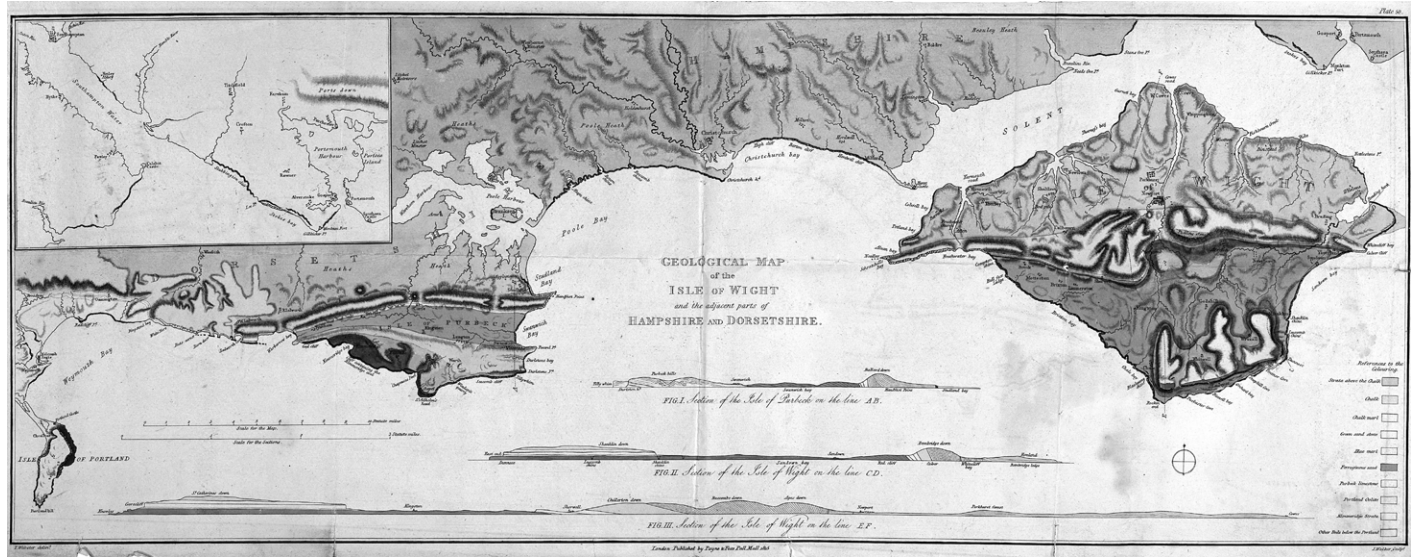


Figure 3 A geological map of the Isle of Wight belonging to John Stevens Henslow. Henslow and Sedgwick brought this map on their field trip of 1819.

The two friends roved over the whole island, hammers in hand and collecting bags at the ready. Each day they rose early and worked methodically through the strata of the island, examining the fossils of the iron sands, the clays, and the chinks. The fresh bright days seemed to sharpen their senses, and their exertions invigorated them. They travelled many miles on foot, clambering up and down outcrops and cliffs, and almost getting caught by incoming tides as they lost themselves in their work. They uncovered dozens of species of ancient shellfish, zoophytes, corallines, and sea plants. And it was on that trip—stirred perhaps by the potential of the new science of geology, the possibilities open to a new professor or a freshly minted graduate, and the knowledge they were creating and would create—that Henslow and Sedgwick began to realize the inadequacies of their Cambridge world. They were undertaking new research, working at the cutting edge of a young science, and refining the techniques of the discipline—but who in Cambridge would care? Lectures were poorly attended, the geology museum was cramped and little-visited, there was no University journal in which they could publish their research, and a disproportionate amount of energy was expended on out-of-date mathematics.²² It was on the Isle of Wight—perhaps on that beach at Alum Bay, as the rocks revealed themselves beneath the hammer, or perhaps in an inn that evening, as they were poring over the delicate fossils they had unearthed—that Sedgwick and Henslow dreamed up a new forum where they could show off their research: a scientific society for Cambridge.²³

Such societies were booming in the late eighteenth and early nineteenth centuries. In London, the venerable Royal Society was joined by a range of new, more specialized societies: the Linnean Society (for natural history) in 1788, the Geological Society in 1807, and the Astronomical Society in 1820. There was also the Royal Institution, which was founded in 1799 and which encouraged new inventions and popularized science for a wide audience. Outside London, the more wide-ranging provincial ‘literary and philosophical’ societies grew up, most frequently in industrial towns: Manchester’s was founded in 1781, followed by the ones in Derby (1783),

Newcastle-upon-Tyne (1793), Birmingham (1800), Glasgow (1802), Liverpool (1812), Plymouth (1812), Leeds (1818), and York, Sheffield, Whitby, and Hull (all in 1822).²⁴ Many of these societies were in Yorkshire, and perhaps it is significant that Sedgwick was a Yorkshireman and made regular trips to that county—he must have seen the great enthusiasm for the philosophical societies at first hand. There had once been a very short-lived scientific society in Cambridge from 1784 to 1786 but, because of the deaths of some of the instigators and due to its ‘not being adequately supported’, it was dissolved soon after its foundation.²⁵

The London societies were generally reserved for the scientific elite, expensive to join, narrowly focused, and aimed at the higher end of society; on the other hand, the provincial societies were mostly made up of the middle classes, extremely broad in scope, had much more modest membership fees, and required no prior knowledge of any of the sciences. Neither model was right for Cambridge. Henslow and Sedgwick considered several options: at first they thought of a corresponding society, but this idea was soon abandoned. They contemplated a society aimed primarily at students, as a way to introduce a little natural history into their mathematical lives, but that too was rejected.²⁶

They left the Isle of Wight at the end of their field trip with the germ of an idea, though without any fixed plans. Easter fell in mid-April that year, so the Easter term was short. Sedgwick was preoccupied with his lecture course, which left him little time to dedicate to setting up a new society. But, later that spring and summer, Henslow and Sedgwick began to write to their friends and colleagues in Cambridge and beyond, outlining their ideas, seeking support, and refining the details.²⁷ Sedgwick’s letters were sent from Suffolk, Somerset, Devon, and Cornwall, where he continued on his mission to learn as much practical geology as possible before the next term began.²⁸ He was fascinated by the new landscapes he saw, and also by their inhabitants. From the Mendip and Quantock hills of Somerset, he wrote:

The country I have just been describing wants some of the grander features, but in beauty, luxuriance, and variety, yields to none. The rugged

cliffs which rise perpendicularly on both sides of the Bristol Channel are in many places exquisitely contrasted with the fine lawns and rich foliage which go sweeping down to the very edge of the water. As for the people of Somersetshire, they seem a mighty stupid good sort of people, who have not wit enough to cheat a stranger. The men get drunk with cider, and the women make clotted cream.²⁹

Over the following decades, Sedgwick would tour the whole country in this way—rambling across the counties, observing the contours of the land, collecting fossils, and watching for the strata as they rose and fell below the surface of the earth.

Henslow, meanwhile, had also caught the geology bug. He spent the summer of 1819 in the Isle of Man, where, by happy coincidence, a local brewer had just discovered the fossilized skeleton of a giant Irish elk in a marl pit. The village blacksmith, a man named Thomas Kewish, used his knowledge of horses to reconstruct the skeleton—a feat which Henslow gleefully described to Sedgwick: ‘you know I am not much given to the marvellous, but I really think I never saw a more magnificent sight of the kind in my life, and doubt if the Petersburg Mammoth would surpass it... the fellow has really put it together with very great ingenuity.’³⁰ Henslow was so impressed that he tried to buy the enormous beast for the Woodwardian Cabinet, but the local duke had claimed it for his own and, despite Kewish’s attempt to smuggle it into hiding, the duke later gave it to the museum at Edinburgh University.

After a happy summer of geologizing, the autumn closed in and Sedgwick and Henslow had to conclude their tours. In October 1819, the two men returned to Cambridge for the start of a new term. The low, flat fens that surrounded the city made a stark contrast to the dramatic cliffs of the Isle of Wight, but the two friends had not forgotten the vision they had conceived there. As the college and university men reassembled in Cambridge, Sedgwick and Henslow could take the next step in realizing their ambition.

They called upon Edward Daniel Clarke (see Figure 4). A former fellow of Jesus College, Clarke was an eccentric collector of antiquities, an inveterate traveller, and a sometime lecturer in mineralogy. He had once dedicated