

# A walk to Siccar Point

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*Deep time is a concept that expresses the vastness of geological time. Siccar Point is a site where the field evidence of deep time was first seen for what it represents, by James Hutton, in 1788. The site is located in south-east Scotland at the shoreline of the North Sea, and it can be accessed on foot. This article takes a journey across the modern Scottish landscape and through deep, imaginary time.*

Our journey takes us through a sloping green landscape flanked by rolling hills. There are meadows of waving grasses, all of a similar colour and shape, undulating as if about to coil themselves up. Cattle form jet-black silhouettes, like sheep cut out from a picture, charcoal grey and black-headed, constantly chewing their cud and mooing. Sparse woodland grows by the roadside – stands of Scots pine with maturing trunks and slender crowns. Their branches harbour jackdaws, a couple of them dozing, or maybe uttering the odd ‘tchack’. There is a blue sea, with a gentle swell of deeper blue, wavelets curling to the sky.

When we are on a journey to deep time, where are we actually headed? Assuming that deep time and the present moment have some kind of concrete intersection, something other than the place where we live right now – perhaps some surface of the space-time continuum on which we can stand, breathe, pause – what would that be? If and when such a point exists, how do we reach it, and where will we end up? It will be something ancient, something geological, and both of these at once, insofar as it is also something historical. Our journey is towards the south-eastern corner of Scotland, to Siccar Point.

In my mind, I head not only to where we are going, but also to the place we’ve come from – Aberdeen. I walked its streets just yesterday, Great Northern Road, King

Street, Orchard Street. All the houses the same colour, stone grey. Once upon a time, men dug a cavern 500 feet deep into the rock there (Mellor 1963), raising walls from the depths, granite, all the same colour and size, stone upon stone.

The mind turns to James Hutton (1726–1797, Fig. 1) and to Edinburgh nearly 250 years ago – to that corner of the world and those years when ‘Theory of the Earth’ saw the light of day. Hutton’s life was marked by the Scottish Enlightenment (Wood 2019a). That was a miraculous epoch in 18th-century Scotland, and today it is legendary. Enlightenment-era Edinburgh became known as ‘The Athens of the North’, and the title was no exaggeration.

It was here that Hutton lived his later years in a preeminent community of highly intelligent men. They had broad interests, were original and bold in their thinking. The same was true of Hutton who was not oriented simply to geology – in fact he had much wider interests both in personal experience and subject matter. His close circles included Adam Smith and Adam Ferguson, and the same intellectual circles were enlivened by people of genius such as James Watt, Benjamin Franklin, and William Eden. Yet Hutton had already had a long and meandering life journey before entering these circles. He was born in Edinburgh, where he entered the University in 1740 to study humanities – this despite his



Figure 1. James Hutton, a caricature. John Kay etching (1787) © National Portrait Gallery, London.

Kuva 1. James Hutton, karikatyyri. John Kayn etsaus (1787) © National Portrait Gallery, Lontoo.

enthusiasm for chemistry. His student years encompassed the Jacobite Rising in 1745 and the occupation of the town (McIntyre 1997, 1999). In the years that followed, Hutton studied chemistry and anatomy in Paris, but it was in Leyden that he completed a medical dissertation on blood circulation (Donovan & Prentiss 1980). Having inherited farming property in Berwickshire, in south-eastern Scotland, he set off for Norfolk to study rural economy in the early 1750s (McIntyre 1997, 1999). Indeed, farming in Berwickshire was of decisive importance for the geological theories that Hutton would make public some years later (Jones 1985). In this environment,

Hutton became puzzled by the erosion of farmland, noting the concomitant instability of the Earth that should in the long run have led to the purposeless destruction of fertile agricultural land (Montgomery 2003).

At first glance, the purposelessness of erosion may seem like an irrelevant issue for a modern scholar. But for Hutton (1788), the Earth was a 'beautiful machine' which, from his deistic religious viewpoint, should not have such an 'error in its constitution' that it promotes its own self-destruction, given that soil is 'so necessary in the system of the globe, in the oeconomy of life and vegetation'. Combining this reasoning with existing

observations of unconformities, as found in French literature (Montgomery 2003; Rossetter 2018), Hutton formulated his theory of a rock cycle. It was a cycle that could renew the soil, and keep the machine – i.e. the Earth – running, in such a way as to support life in all its forms. Soil was not only washed to the sea but brought back to the land, in the form of solid rock, by the action of the internal heat of the Earth – to become once again eroded. Indeed, the core of the Huttonian theory was the concept of cyclic changes in the Earth, similar to the circulation of blood – the topic of his dissertation – leading him to postulate the world as an organic whole (Tomkeieff 1949). More generally, and revolutionarily, according to his theory, the globe had not been a non-evolving static product since Creation, which was calculated as having occurred around 6,000 years earlier (Fuller 2005). Humans had not so far been obliged to consider science and religion in terms of possibly conflicting domains of authority ('magisteria') and personal belief, unlike today (Helama 2024).

After Torness Nuclear Power Station we arrive at a bend. Here, a narrow country road branches off into a well-trodden path through a green meadow. Tall grass sways in the wind, and we note the yellowness of buttercups, the winding trail, and the dry brown muddy streak worn down by footsteps. We are far from being the first to come this way. We pass the ancient ruins of a stone house, walking alongside one of the stone walls found at the edge of every meadow, heading towards the tip of the promontory. We become aware of light rustling in the grass, the breathing and scent of soil, of grassy stalks. The sky is windy, blue, cloudy, and bright. And all this at the same time.

The path winds on and on until, suddenly, the sea opens up before us, broad, darker than the sky, splashing, as if determined to have the last word. And yet it is still far away,

down below, shaped into a rocky coastal strip – Siccar Point, right on the edge of the North Sea.

As an almost-symbolic climax to the short hike, it's time to descend. Indeed, to reach our destination, the final steps to Siccar Point must be taken, down a steep, muddy, grassy, and surprisingly long slope. How else could it be? Since we are arriving precisely at the earthly sanctuary of deep time, if such a metaphor is allowed, and thus by the very path that is characteristic of it. And one could not reach Siccar Point otherwise than by descending. Except that ...

Except that Hutton, Playfair, and Hall reached Siccar Point by a boat they had launched from Hall's ocean front estate near Edinburgh. They had sailed south-east, viewing the coastline cliffs, trying to understand what they were seeing, trying to see what they could understand. Hutton had already presented his 'Theory of the Earth' before the Royal Society of Edinburgh, and the full presentation had waited three years to be published (Hutton 1788; Oldroyd 2000). The theory was still to be verified. Up to now, Hutton had been more of a geological theorist and natural philosopher, but he was now turning into a practitioner of field geology – a discipline in which angular unconformities<sup>1</sup>, in particular, provide field evidence for strata that have been deposited onto the surface of previously consolidated and elevated strata (Rossetter 2018). In fact, Hutton was probably the first person to work out the significance of unconformities, and to deliberately set out to discover them in the field (Tomkeieff 1962). Around the beginning of June 1788, the three men arrived at Siccar Point. It was a clear day, perhaps akin to that of our own journey, and it would mark one

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<sup>1</sup> An angular unconformity is characterized by an angular discordance, a difference of strike or dip or both, between older and younger strata (Waldron & Snyder 2020).





Figure 2. Hutton's angular unconformity at Siccar Point. Photo: Samuli Helama.

Kuva 2. Huttonin Siccar Pointista löytämä kulmaepäjatkuvuus. Kuva: Samuli Helama.

of the most famous field trips in the history of geology. Indeed, the trip is one of the most celebrated in the literature, having inspired both academic and more evocative reiterations (McPhee 1981; Gould 1987; Montgomery 2003; Kerr 2018; Wood 2019b).

The strata the three men observed at Siccar Point are now right in front of us. Here, the rock layers are so obvious that one cannot ignore them, and can almost read them like pages in a book (Fig. 2). The strata are formed by Silurian deep-water greywackes and Devonian fluviatile Old Red Sandstones. The latter are gently dipping and unconformably onlapping the former, which are in vertical position. The result is an angular unconformity with a 60-million-year gap (Archer et al. 2017). Bear in mind that the words we now use to describe the deposits observed by Hutton and his

colleagues were not then available. They were unable to name the process that had generated the unconformity as 'orogenic tectonism' (Miall 2016). They had no idea of the Old Red Sandstone Continent having been located around 20° S during the Devonian, or of the emerging Caledonian mountains at the foot of which the sand accumulated (Mykura 1983). I myself read this information in the book entitled 'Geology of Scotland', which is inscribed: '*Ostettu Edinburghissa 1985. K. Laajoki*'<sup>2</sup>. I find myself standing on the shoulders of giants, or at Siccar Point, following in their very footsteps.

The gap between us is remarkable. They had no established names for the rocks, and

<sup>2</sup> Purchased in Edinburgh 1985. K. Laajoki.

they did not know the age of the rocks they observed. For Hutton, this was a 'junction' between 'alpine schistus' and 'low-country' strata. The taxonomy of geological time or modern rock classification did not yet exist. They had no geochronometric numbers in their mind to supplement the stratigraphy – and stratigraphy had not yet been coined as a word. The discussion they had must have been very different from the discussions we engage in, to the extent that we – today's geologists – might not have understood much of what they said. To be honest, they themselves might not have understood much about the rocks they observed and discussed. Yet, their discussion was more important for the history of geology as a science, or for the natural sciences in general, than any current discussion on rocks or sediments of any type. We say a lot in order to refine small details, while they said a lot using just a few words. We may no longer use many of the words they used, or we may use the words differently. Nevertheless, we still apply the comprehension of the earth's past that they developed.

The eye-catching unconformity of Siccar Point evidently astonished Hutton and his companions. In fact, Hutton had already observed angular unconformities in the field (Tomkeieff 1962; Montgomery 2003), but here this structural feature was more obvious than anything he had seen previously. This outcrop provided confirmation of his theory in a manner that he could at one and the same time share with his colleagues. They could now see the outcome of the ancient cycles with their own eyes. And given that processes in action today could explain the formation of those ancient rocks, the deposits provided geological evidence of the cycles. They could see that such cycles existed, but it now dawned on them that this could hardly be all that had ever been. How much, how many cycles, belonged to the Earth's history – this they could not see. That part was left for their

imagination, and that part has carved itself into the most famous of Hutton's phrases – a sentence encapsulating the science of modern geology, and expressing the fascination of geology as a science: 'The result, therefore, of our present enquiry, is that we find no vestige of a beginning, no prospect of an end.'

The phrase may be as immortal as the message it carries, yet it carries the weight of a prediction (Rossetter 2018). When Hutton (1788) wrote the phrase as the concluding remark of his theory, he had not yet seen an unconformity in his life. When Hutton gave us deep time, he derived it from the process of dreaming the outcrop (Frodeman 2003).

For Playfair, the visit to Siccar Point was a pivotal experience. He understood that this man, Hutton, who was a medical doctor and former farmer, but neither a professor nor a baronet, was someone to be listened to. Indeed, Playfair (1802) was to become a herald of the Huttonian theory. Recalling the visit, he was to write (Playfair 1805): 'What clearer evidence could we have had of the different formation of these rocks, and of the long interval which separated their formation, had we actually seen them emerging from the bosom of the deep?' Hall, who was on his way to becoming an esteemed geologist, is known to have drawn a sketch of the unconformity that has become widely reproduced (Archer et al. 2017; Kerr 2018).

The sun-drenched warm rock feels almost softer to the touch, the surface of the hard rock. There are two strata right by the sea: Silurian greywacke and Old Red Sandstone, an angular unconformity. Perhaps those three men stood right here, heard the water, saw the stones in the clear air, in sunlight, their insights clarified by the observations recorded by Hutton and Playfair, each in their own words, manners, styles:

Hutton (1795): '[A]t Siccar Point, we found a beautiful picture of this junction washed bare by the sea. The sand-stone strata



Figure 3. Siccar Point seen from a distance (the opposite shore, approximately where the land ends in the middle of the photograph). Photo: Samuli Helama

Kuva 3. Siccar Point etäältä nähtynä (missä vastaranta loppuu mereen kuvan keskimaillla). Kuva: Samuli Helama.

are partly washed away, and partly remaining upon the ends of the vertical schistus; and, in many places, points of the schistus strata are seen standing up through among the sandstone, the greatest part of which is worn away. Behind this again we have a natural section of those sand-stone strata, containing fragments of the schistus.’

Playfair (1805): ‘Here, therefore, the immediate contact of the two rocks is not only visible, but is curiously dissected and laid open by the action of the waves. The rugged tops of the schistus are seen penetrating into the horizontal beds of sandstone, and the lowest of these last form a breccia containing fragments of schistus, some round and some angular, united by an arenaceous cement.’

The splash and spray of the waves, the distant white surf, the birds above the sea with grey-white cries, the layers rising from the sea. A machine created for a purpose, was how Hutton described it. Waves, the moist lips of the sea’s surface, layers with small fragments

of larger stones, a collective witnessing of the forces permeating the planet, and everything, absolutely everything both visible and invisible, manifesting the eternal cycle of unstoppable, tireless movement.

Whatever the Earth contains it manipulates, forming something both momentary and very old. According to Gould (1987), we can really only comprehend deep time as metaphor. But deep time can clearly be more than that. The apprehension of deep time, of the depth of time, and of the vastness of scales, is primarily based on observations, on perceiving (Zen 2001). Insight, the seeing eyes of the mind. How beautiful it must have been here for those who experienced that first awakening. It was no longer a theory, a belief, or a model. It was what it is. Containing the unbearable lightness of being, and depth, with the same words applicable to both.

A couple of days later, we see Siccar Point again, now from afar, from the other side of the bay (Fig. 3). Even motionless, it rises



from the sea, as if enacting a metaphor, slowly, reverentially, and in the untouched distance, the wave of deep time rolls silently. The weather is clear, but the far shore is hazy. The sea is here too, where it is not. In the air, in the shore's stones, in the gazes. In one's irises. A lonely cormorant was sitting on a rocky outcrop, scanning the sea, seeing something invisible to humans. The indefinite colouring of the outcrop suggests that the place has been used since time immemorial. If the salt crystallizing from the sea's scent could be crunched between the teeth, now would be the time. Now – or else never. A whole mouthful. But one cannot chew everything.

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## Tiivistelmä

### Taivallus Siccar Pointiin

Syvä aika on käsite, joka ilmentää vaikeasti hahmotuvaa geologisen ajankulun mittakavaa. Siccar Point on kaakkois-Skotlannissa Pohjanmeren kallioisella rantavyöhykkeellä

sijaitseva maastokohde, jonka James Hutton (1726–1797) kollegoineen löysi vuonna 1788. Usein esitetyn kertomuksen mukaan Hutton antoi kohteen stratigrafisen tulkinnan tuoreeltaan paikan päällä. Tulkinta tuki hänen aiemmin esittämänsä teoriaa maapallon syvästä ajasta, ja sillä tuli olemaan ratkaiseva merkityksensä geologisen tieteenalan kehityksen kannalta. Hutton saapui paikalle vesiteitse, mutta kätevämmiin Siccar Pointiin voi tänä päivänä taivaltaa jalan, skotlantilaisen maalaismaisema halki. Käynti kohteella saa vierailijan pohtimaan niin ajan olemusta kuin geologian historiaa. Yhden käsityksen mukaan voimme käsittää syvän ajan vain mielikuvana, toisen mukaan ymmärrys siitä voi syntyä nimienomaan geologisen havainnointeja tulokseksi. Huttonille kyse oli ensin teoriasta, sitten havainnoista ja niiden tulkinnasta. Niiden mukaan havaitut kulmaepäjatkuvuusspinnat kerrostumien välillä osoittivat geologisten prosessien jaksottaisuuden. Aikaa ei voinut lukea kivistä suoraviivaisesti emmekä tulisi löytämään kivistä syklien alkua, emme taivottamaan niiden päätöspistettä. Huttonin oma kielikuva kuului: *'we find no vestige of a beginning, no prospect of an end.'* Maapallon oma aika jäisi toisin sanoen ihmiskunnalle suodun hahmotuskyvyn ulottumattomiin. Siccar Pointissa kävijä seisoo täsmälleen siinä missä Hutton seisoi, näkee omin silmin saman minkä hän, ”sielunsa silmin” kenties vielä kiviä kauemmas. Ja silloin hän voi kenties nähdä kauemmas kuin muutoin, silloin hän voi kenties nähdä kuten Hutton.

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