DIALOGUES WITH DARWIN

Charles Darwin - Some Scottish Connections

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Institute for Advanced Studies in the Humanities
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Darwin's bicentenary

2009 marks the bicentenary of Charles Darwin's birth on 12 February 1809, and the 150th anniversary of the publication of *On The Origin of Species*, on 24 November 1859. Darwin's student years in Edinburgh were an important period in his intellectual formation: here he encountered the fruits of the Scottish Enlightenment, from the revolutionary geological theories of James Hutton to important advances in medical theory and practice, and adventurous developments in theological and philosophical thought fostered in the University and the City.

In conjunction with the University of Edinburgh and other Scottish and UK-wide academic and scholarly institutions, the Institute for Advanced Studies in the Humanities (IASH) joined the Edinburgh celebrations for the bicentenary by organising a series of "Dialogues with Darwin: Darwin and Edinburgh". The five symposia, held in the spring of 2009, explored aspects of his work in Scottish contexts including circumnavigation, anatomy, theology, and evolution itself. Together, these talks and discussions led by a series of international and local experts offer new angles for understanding Darwin as both a catalyst in the broader Enlightenment project and a model for its subsequent impact. From Patrick Geddes to Charles Bell to James Crichton-Browne, the Edinburgh connection offers a rich kaleidoscope of historical and intellectual links.

The speakers in the series were Professor Ian Duncan (University of California, Berkeley) on "Darwin, Circumnavigation, and the Aesthetics of World History"; Professor David Fergusson (University of Edinburgh) on "Darwin in Scotland";
Dr. Walter M. Stephen (former Chairman of the Sir Patrick Geddes Memorial Trust) on "Charles Darwin: Some Scottish Connections"; Dr. Gregory Radick (University of Leeds) on "Edinburgh, Enlightenment and Darwin's *Expression of the Emotions*"; and Revd. Dr. John Polkinghorne (St. Edmunds College, Cambridge) on "Evolving Creation". Each paper is published separately in this series of IASH Occasional Papers.

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by

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2009

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This series of occasional papers is published by

The Institute for Advanced Studies in the Humanities

The University of Edinburgh

2 Hope Park Square

Edinburgh EH8 9NW

Published November 2009

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ISSN 2041-8817

ISBN 978-0-9532713-6-8

IASH Occasional Papers, 12

About the author

Walter M. Stephen, MA, MEd, PhD, FSAScot was, successively, Principal Teacher of Geography in schools in Fife and Edinburgh, Adviser in Social Subjects in Edinburgh and Senior Adviser (Curriculum) in Lothian. He established and operated Castlehill Urban Studies Centre for over twenty years. It was the first successful Urban Studies Centre in Britain and a late 20th century expression of the ideas and methods of Patrick Geddes.

As recreation at this period he led community classes and research groups. His study of the rise and fall of a Fife oil-shale enterprise and community was described as 'a model of its kind'. Papers were published in journals as diverse as *The Dominie*, *Scottish Educational Journal*, *Scottish Mountaineering Club Journal*, *The Journal of Industrial Archaeology*, *The Bulletin of Environmental Education* and the *Proceedings of the Society of Antiquaries of Scotland*. On retirement he spent some time devising curriculum packages linking particular local environments with the teaching of particular sections of national guidelines, for which no provision had been made, locally or nationally.

From 2004 onwards he has been responsible, as author or editor/contributor, for a range of publications. As a former Chairman of the Sir Patrick Geddes Memorial Trust he planned, edited and contributed to *Think Global, Act Local: The Life and Legacy of Patrick Geddes*, *A Vigorous Institution: The Living Legacy of Patrick Geddes* and *Exploration*, a field manual inspired by Geddes. *Where was Patrick Geddes Born?* solved the mystery of his birthhouse. Walter Stephen edited and introduced new editions, in 2006, of Victorian Willie Park Junior's books *The Game of Golf* (1896; the first book about golf written by a professional) and *The Art of Putting* (1920), as well as *Willie Park Junior: The Man who took Golf to the World*, nominated for the US PGA Book of the Year Award. He also edited and introduced *A Herd of Red Deer* (Luath Press, 2008), by Frank Fraser Darling, the first naturalist to study large mammals – the Scottish red deer – in their own habitat.

Synopsis

Darwin did not burst, perfectly formed, from the brow of some goddess. Indeed, if we are to believe Stephen Baxter, Darwin was well into adulthood before he could see clearly. In *Revolutions in the Earth* (2003) Baxter wrote: 'In the nineteenth century even Charles Darwin would graduate from Cambridge University believing that the world was six thousand years old, give or take.' Can we believe this? And if we do, how could Darwin have come through two years of the Edinburgh system of his time - still 'a hotbed of genius' - untouched by the currents of thought around him? The concept of 'deep time' was necessary for evolution and natural selection to work; when did Darwin acquire it? And why did he feel it necessary to conceal its acceptance? Walter Stephen examines the conflicting evidence from Darwin's student days, and from the Beagle voyage, to reveal a complicated mixture of diffidence, ambiguity and reluctance to offend.

In the second half of the paper Walter Stephen considers the case study of Patrick Geddes, a young man from a very modest background in a small provincial city, with the sketchiest of qualifications, who was able to break into the upper echelons of the scientific society of the later nineteenth century, aided in part by Darwin. Geddes later had a role in the dissemination and interpretation of Darwin's ideas and Stephen shows how the interpretation became more subtle with the passage of time.

Introduction

'In the nineteenth century even Charles Darwin would graduate from Cambridge University believing that the world was six thousand years old, give or take.' Thus wrote Stephen Baxter in *Revolutions in the Earth* (2003). Can we believe this? And if we do, how could Darwin have come through two years of the Edinburgh system of his time – still 'a hotbed of genius' - untouched by the currents of thought around him? The intention of this paper is to examine two questions, one relating to Darwin's early years and the other related to his latter years and legacy.

In attempting to answer the question of 'how Darwin managed to shut out the concept of "deep time" despite having spent two sessions studying at Edinburgh', I shall follow up two lines of investigation, explored in the sections entitled 'Three Men in a Boat', and 'Silent, upon a peak in Darien'. The second question is, in effect, a case study that can be summarised as follows: how did a young man from a very modest background in a small provincial city, with the sketchiest of qualifications, break into the upper echelons of the scientific society of his time? Under the heading 'Charles Darwin and Patrick Geddes', I will examine Darwin's influence on the young Patrick Geddes. The final section, 'Patrick Geddes and Charles Darwin', will describe and analyse Geddes's role in the dissemination and interpretation of Darwin's ideas.

Part I

I. Three Men in a Boat

In 1805 John Playfair described a short journey by boat, carried out by three men of the Enlightenment; they were John Playfair, James Hutton and Sir James Hall, who, in 1788, had sailed from Dunglass round the Berwickshire coast to Siccar Point. As Professor of Natural Philosophy, Playfair (1748-1819) was:

> cast in nature's happiest mould, acute, clear, comprehensive, and having all the higher qualities of intellect combined and regulated by the most perfect good taste, being not less perfect in his moral than in his intellectual nature. He was a man every way distinguished, respected, and beloved.

Sir James Hall was the first to demonstrate experimentally how limestone was metamorphosed into marble, while Hutton (1726-1797) was a doctor who had studied agriculture and taken up the practical applications of chemistry, moving into geology in 1768. They landed at Siccar Point, and, as Playfair wrote, "we found that we actually trode on the primeval rock". The group proceeded to analyse the palpable evidence of geological deposition. We my summarise it as follows. In what used to be known as Silurian times, shales and other rocks were laid down under water.

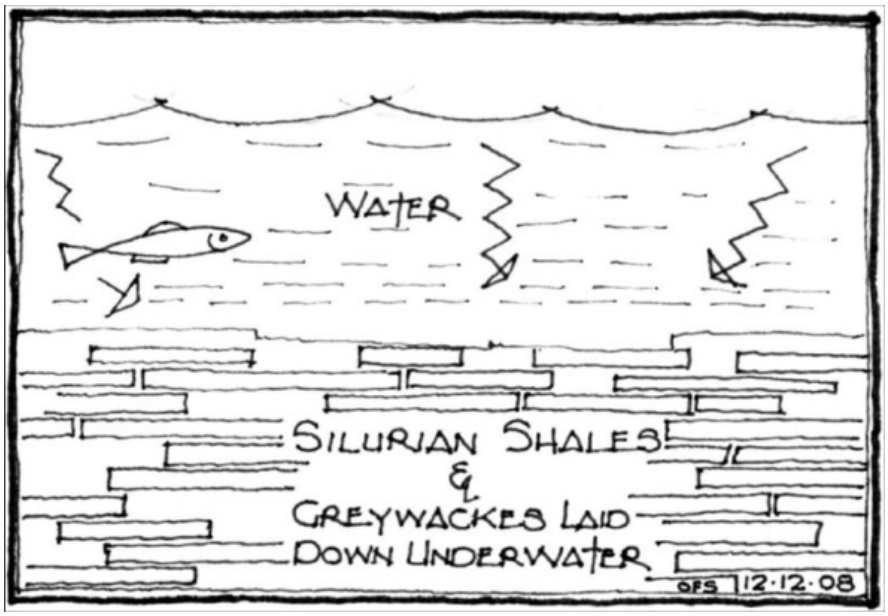


Figure 1 – Siccar Point, Phase 1

Over tens of millions of years these rocks tilted, were uplifted and partially worn away by wind and water.



Figure 2 - Siccar Point, Phase 2

In the subsequent Old Red Sandstone period, the Silurian rocks were covered by water and more sediments were laid down. These

included sandstones and a rock-like sandstone which contained fragments from the Silurian rocks.

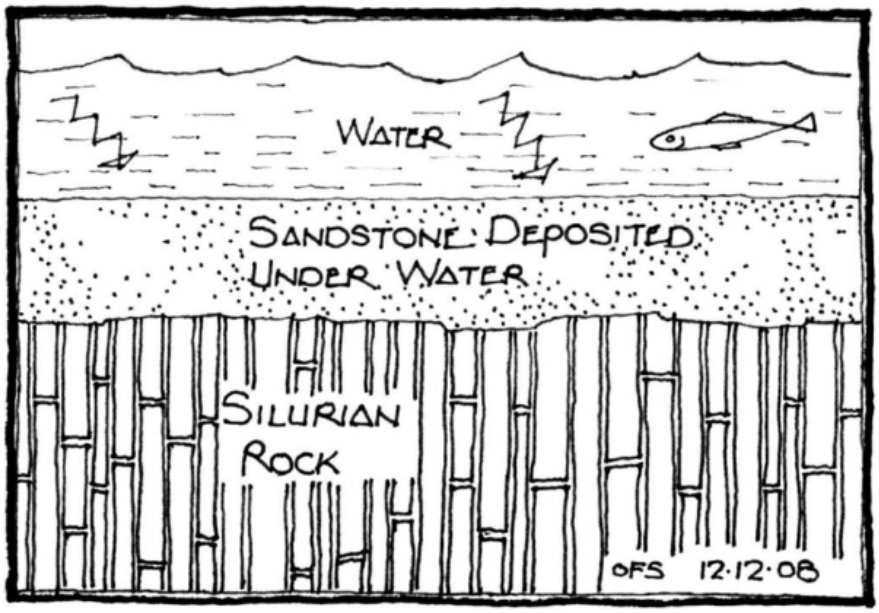


Figure 3 - Siccar Point, Phase 3

The line separating the Silurian rocks from the newer sediments above is called an 'unconformity' and represents the earlier extended period of uplift and erosion, followed by submergence and deposition of the sandstone.

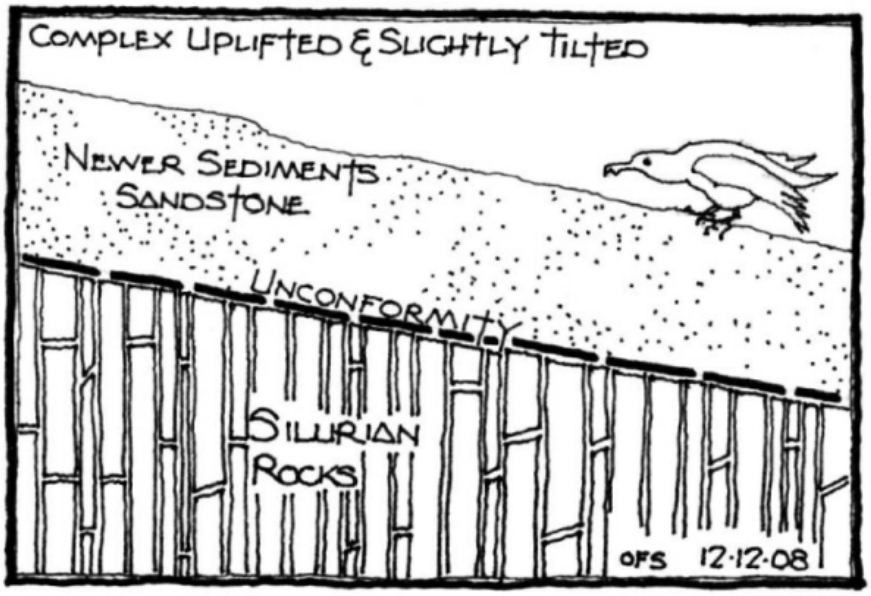


Figure 4 - Siccar Point, Phase 4

The Old Red Sandstone was horizontal and under water when its sediments were accumulating. Now it is slightly tilted and above sea level. This tilting and uplift must also have taken a long time. Playfair was clearly moved by the processes being revealed to him so clearly:

> We often said to ourselves, 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? We felt ourselves carried back to the time when the schistus was still at the bottom of the sea… An epoch still more remote presented itself… Revolutions still more remote appeared in the distance of this extraordinary perspective.
>
> The mind seemed to grow giddy by looking so far into the abyss of time.

Playfair's companion James Hutton was not alone, nor the first, in his speculation about the very fundamental origins of the planet. For him 'the present was the key to the past' and, therefore, there was no need for supernatural explanations. What was said by him in the 'Introduction' to his *Theory of the Earth* (1795) is worth repeating: 'We find no vestige of a beginning, no prospect of

an end' - an uncomfortable thought which many, at the time and later, have chosen to misunderstand.

Hutton's account of 'deep time' was inflammatory in its context. Bishop James Ussher in 1650 used the Old Testament to say that the world was created on the 22 October 4004 BC, a Saturday, about six in the evening. The Jews kept in step, estimating that the same event took place in 3761 BC. For the Muslims the act of creation was of a similar order of magnitude. These dubious authorities were to prove a major obstacle to a rational understanding of natural processes.

Such ideas did not go unchallenged in the eighteenth century. In France, Buffon (1707-88), author of the 36-volume *Histoire Naturelle*, was another eminent intellectual who was worrying away about the age of the earth and the act of creation. Among much else he studied sedimentation and, assuming the Alps were composed of uniformly uplifted sediments (in itself a pretty big assumption), he considered the highest mountains of France to be about 28,000 years old. The earth was getting older, but there was still a long way to go before Hutton introduced the concept of deep time.

It would be reasonable to expect that Hutton's 'Eureka moment' should be commemorated in some suitable way. After all, there are countless memorials to faith in the power of God – great cathedrals and temples, paintings and sculptures, places of

pilgrimage, miraculous cures. Hutton's Unconformity, by contrast, rates very low as a tourist attraction; very few have the courage or skill today to go for the approach from the sea. Instead, by a farm track off a minor road, there is an interpretation board showing how to go round two fields, skirting the clifftops to Siccar Point, where one descends a wet slope, as steep as a grassy slope can be without becoming rocky. Great sheets of rough Old Red Sandstone conglomerate are worked over by the North Sea at high tide but, when the tide recedes, a complex pattern of clefts and rock pools is revealed.

However, it does not worry me that there is not a monument at Siccar Point. Edinburgh has its Dynamic Earth, a superb interpretation centre using all the modern techniques and technologies to recreate the processes Hutton first described and interpreted. In Greyfriars Kirkyard there is a memorial plaque to the 'Founder of Modern Geology' while, situated between a multi-storey car park and some shabby tenements, the Hutton Memorial Garden marks the site of his house, where *Theory of the Earth* was written. A lump of Triassic sandstone has a cartoon of Hutton and the quotation 'We find no vestige of a beginning, no prospect of an end.'

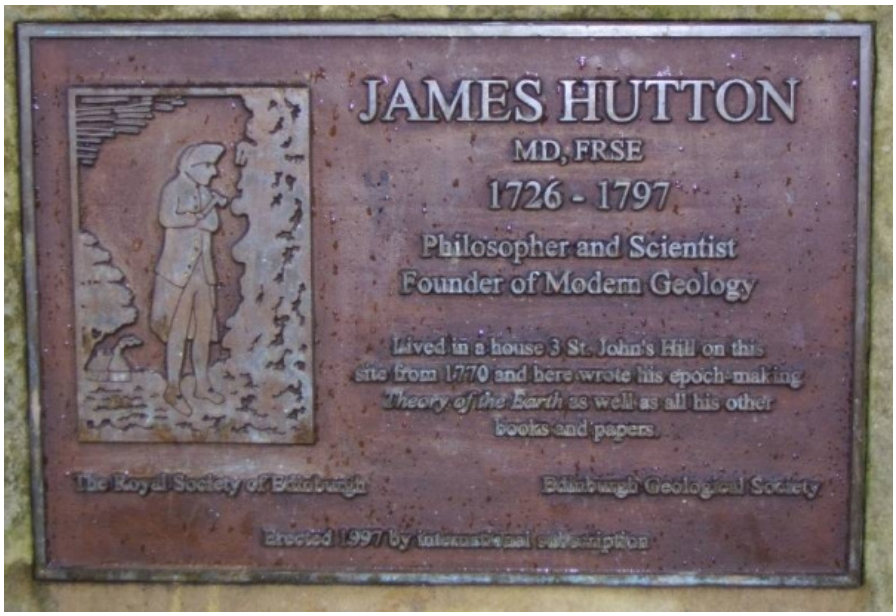


Figure 5 – Hutton plaque, Hutton Memorial Garden

Around are boulders from Glen Tilt and other localities associated with Hutton. Looming over the site are Salisbury Crags, with Hutton's Section and Hutton's Rock out of sight beyond the Cat's Nick, reminding us that 'humans and their petty doings come and go, but the geology endures.' All over the world are geological exposures – in cliffs and quarries and road cuttings, in the walls of houses and gardens – which can tell a story if we only apply the kind of thinking that Hutton deployed. At Siccar Point there is the lonely shore, the rocks and one's thoughts. If, like Playfair, we can realise 'how much further reason may sometimes go than imagination can venture to follow', that is sufficient memorial to a great thinker.

Hutton's *A Theory of the Earth* of 1795 did not immediately command universal acceptance but it certainly caused a ferment of

ideas about Creation and the age of the Earth. Many prominent 'philosophers', who retained some sort of belief in Biblical creation and catastrophic interventions, vigorously attacked the book's ideas. Hutton died in 1797 and was thus spared much vilification and having to read Kirwan's *Geological Essays* of 1799. Playfair took up the cause on behalf of Hutton and his ideas.

In 1824 Charles Lyell, as a keen young geologist, was taken to Siccar Point by Sir James Hall. It was the first volume of Lyell's *Principles of Geology* (1830) which the young Darwin took with him on the *Beagle* and which he said opened his eyes to geology.

By the time that Darwin came to Edinburgh University, although Playfair had died in 1819, there would still have been a scientific community who had known Playfair and his campaigns on behalf of Hutton's ideas, and who tacitly accepted the evidence and arguments for a very distant creation and a long, slow geological history. There was still a kernel of prominent diehards; such were Georges Cuvier (1769–1832) in France, Abraham Werner (1749–1817) in Germany and Professor Robert Jameson (1774-1854) in Edinburgh, teaching the geology course, which was 'the largest course of its type in the world.'

Charles Darwin (1809-1882) followed his elder brother Erasmus to Edinburgh University in 1825, at the age of sixteen, and spent two academic sessions here as a medical student. Darwin found the lectures 'intolerably dull', while his specific

comments are rather illuminating: 'Dr Duncan's lectures on Materia Medica at 8 o'clock on a winter's morning are something fearful to remember'; and, also, 'Dr [Monro] made his lectures on human anatomy as dull as he was himself.' On two occasions Darwin was present at 'very bad operations' and 'rushed away before they were completed', to which he added: 'Nor did I ever attend again.' He considered that 'there are no advantages and many disadvantages in lectures compared with reading.' He noted, during his second year, that Professor of Natural History Robert Jameson – a course which then included zoology and geology - was 'incredibly dull.' He elaborates on his lectures that '[t]he sole effect they produced on me was the determination never as long as I lived to read a book on Geology, or in any way to study the science.' In his *Autobiography* he let himself go on the subject of Jameson:

> Equally striking is the fact that I though [sic] now only 67 years old heard Prof. Jameson in a field lecture at Salisbury Craigs discoursing on a trap-dyke, with amygdaloidal margins and the strata indurated on each side, with volcanic rocks all around us, and say that it was a fissure filled with sediment from above, adding with a sneer that there were men who maintained that it had been injected from beneath in a molten condition. When I think of this lecture I do not wonder that I determined never to attend to Geology.

Nonetheless, Darwin was elected first to the Plinian Natural History Society, founded by Jameson, then to its Council (of five). The young Charles attended all but one of the nineteen meetings held during his time at Edinburgh and took part in discussion on four of the evenings. Papers read included the alleged ovi-position of the cuckoo in the nests of other birds, extra-uterine gestation, the results of the analysis of the Cheltenham waters, oceanic and atmospheric currents, the anatomy of expression, the various purposes to which the formation of a vacuum is applied in the animal kingdom, instinct, and the natural history of the cuckoo - an eclectic programme. He communicated to the Society two discoveries he had made. Darwin was also a member of the Royal Medical Society and attended pretty regularly, although his comment was that 'Much rubbish was talked there.' And he also added that 'Dr Grant took me occasionally to the meetings of the Wernerian Society.[1] I heard Audubon deliver there some interesting discourses on the habits of North American birds.'

The Plinian Society was a strong influence on the young Darwin. One of the meetings occupied his mind for over forty years before he sorted it all out to his own satisfaction in 1872, in *The Expression of the Emotions in Man and Animals.* Dr Robert Grant (who became the first Professor of Zoology in University College, London) was Secretary of the Plinian Society and a considerable influence on Darwin. With zoology (rather than geology) as a

focus, they investigated together the shores of the Forth at Leith, Portobello, Joppa and (perhaps) Dalmeny/Queensferry. Although two of these localities are now classic excursions of the Edinburgh Geological Society, the nearest we come to thinking beyond straightforward description and identification is a reported outburst by Grant on Lamarck and his views on evolution. Darwin listened in 'silent astonishment' but does not seem to have let it affect him at the time.

Jean-Baptiste Pierre Antoine de Monet, chevalier de Lamarck (1744-1829) was a force to be reckoned with. Grant spent five years in Paris and may well have come under Lamarck's influence when there. Lamarck coined the term 'biology' for the new science of natural history and believed that species could 'transmute', that is, evolve from one to another (unlike Cuvier, who maintained that species remained unchanged from the time of the Creation). He also believed that acquired characteristics could be passed on the next generation. Lamarckism was an attractive form of evolution - but new behavioural patterns do not produce inheritable bodily changes; a blacksmith's children do not inherit the iron-band arms their father developed (although they may develop a similar physique by training and through example).

There is a puzzle, however, about this incident with Grant and about the reasons why, fifty years after the event, Darwin chose to record it. What was he trying to prove? Did he think that,

even at this late date, some critic might seek to question his own version of evolution? Was there something discreditable about Grant that Darwin sought to dissociate himself from? And if so, why mention the incident at all?

There is no doubt that Darwin was a good student. He attended the classes, however dull. He took part in cognate activities beyond the core curriculum. He kept a good note-book ('perhaps slight, as judged by modern standards'). But the experience was not enjoyable for him and he did not realise that part of a medicine course was learning not to be sickened by the horrors of early nineteenth century surgery. He was fortunate to have a father understanding and wealthy enough to allow him to drop medicine at Edinburgh in favour of the more congenial BA course at Christ's College, Cambridge.

While in Edinburgh, the same fastidious Darwin took lessons in taxidermy from, as he put it, 'a blackamoor I believe an old servant of Dr Duncan' - a negro ex-slave. For one guinea, Darwin had his company for an hour a day for two months, an enlightening experience and one he used well: 'I used often to sit with him, for he was a very pleasant and intelligent man.' A good sporting shot in his student days, when Darwin was on the *Beagle* voyage he hunted for food for the wardroom, as well as shooting specimens, using his expertise to stuff them, and sending them back to England.

For Darwin's student days there are three main sources. His note-book, begun in March 1827, has survived. His *Autobiography,* started in 1876 - when he was 67 - and added to in 1878 and 1881, devotes six pages to his Edinburgh days. The notebook is an objective record of observations and excursions. There may be errors of identification but the overall result must be near the truth as Darwin saw it at the time. In contrast, suitable caution needs to be exercised when interpreting his *Autobiography*, published when he was 67. In 1935, J.H. Ashworth, Professor of Zoology at Edinburgh, gave a substantial paper of nineteen pages on *Charles Darwin as a Student in Edinburgh, 1825-1827.* Ashworth picked up at least one error of fact: Darwin's communication to the Plinian Society was on March 27, 1827, not 'at the beginning of the year 1826' as stated in the *Autobiography.* This may be too trivial to be concerned about, or it may be the tip of an iceberg of prejudice. Gavin de Beer, editor of the *Autobiography,* had this to say on the subject of recollection:

> With Darwin's *Autobiography* […] there is a comparable discrepancy between his memory and the day-to-day records of the development of his ideas and thoughts. […] A common feature of good autobiographies is that they do not lend themselves readily to collation with journals and diaries kept by the writers at earlier times of their lives. The writer

can see things out of focus with an aberration magnified by hindsight which might lead him astray.

'Autobiographies are essentially works of fiction, whatever biographies may be', was the verdict of Darwin's close friend T.H. Huxley. Moreover, one can argue that there is a clear disparity between Darwin's recollections of his Edinburgh studies and the experiences of contemporaries almost as able as he was. Darwin's opinion of much of his course work was 'dull, dull, dull.' Other gifted students of the same period did not necessarily agree. Robert Christison (later Sir Robert, successive occupant of two medical chairs at Edinburgh) found that Monro 'gave a very clear, precise, complete course of lectures on anatomy […] and certainly I learned anatomy well under him.'

The 'incredibly dull' Jameson had been Professor of Natural History for 22 years and covered mineralogy, zoology and geology. He edited the *Edinburgh Philosophical Journal* and the *New Philosophical Journal* and developed an extensive and important Natural History Museum in the University. Notable for 'the excellent state of preservation of its specimens and their scientific arrangement and for its large collection of birds', the entire museum collection, 'second only to that of the British Museum', was handed over to the new Government Museum of Science and Art, later the Royal Scottish Museum and now the Royal Museum

of Scotland, a year after Jameson's death. However, he did attack Hutton both in print and before his students in the field – Salisbury Crags. It is of some significance then that upon Hutton's death his specimen collection passed to the University Museum, where it was not displayed and gradually disappeared.

In the course that Darwin took in his second year there were about 100 lectures, five days a week, 'conversations' with the Professor in the Museum and excursions. Edward Forbes took Professor Jameson's course in 1832 and succeeded him as Professor in 1854. He found Jameson's collection 'wonderful, even palaeontologically', and the illustrative material 'very great'; he spoke of his professor's 'enthusiastic zeal, his wonderful acquaintance with scientific literature.' To this judgment he added:

> The value of professorial worth should chiefly be estimated by the number and excellence of disciples. A large share of the best naturalists of the day received their first instruction in the science from Professor Jameson […] And where else in the British Empire, except here, has there been for the last half century a school of Natural History?

Christison attended the course of 1816, when:

> Lectures were numerously attended in spite of a dry manner, and although attendance on Natural History was not

> enforced for any University honour or for any profession, the popularity of his subject, his earnestness as a lecturer, his enthusiasm as an investigator, and the great museum he had collected for illustrating his teaching, were together the causes of his success.

Later, in the context of Darwin's suitability for the *Beagle* project, Adrian Desmond and James Moore rather patronisingly concede in *Darwin* (1991) that 'Jameson's Edinburgh course, as luck would have it, had catered for colonial travellers.' Luck had nothing to do with it; Jameson's course was a vocational one aimed at equipping young men with the wherewithal to make their way in the world forth of Scotland. In their *Darwin's Sacred Cause* of 2009, the writers make amends by analysing Jameson's as 'a course packed with the next generation of travellers: surveyors, civil engineers and army surgeons.'

Why was Cambridge more congenial? Darwin was, of course, more mature with the experience behind him of working at something he did not enjoy. Perhaps he responded better to the relaxed English way, as opposed to the stern drive of the Scots. At Edinburgh he had lodged in the town; college life at Cambridge suited perfectly 'a young man with easy manners and a cheerful disposition who could ride and shoot.' We hear little of his course work but can see developing a Cambridge University network which stood him well in later years.

How, then, if Stephen Baxter is correct, did Darwin manage to avoid absorbing the concept of 'deep time' during his two years at Edinburgh? I think there are two explanations, one very simple and another more mysterious. When I was young there were many young lads – seldom girls – who collected the numbers and names of railway engines, who could go on for hours about A4 Pacifics, Stanier Black Fives and the Scott class, and could even spell 'Walschaert's Valve Gear' without conceptualising their knowledge by asking questions like 'why?' or 'why there?' Similarly, Darwin's enthusiasm at sixteen was for observing and collecting in the field – 'bug-hunting' – rather than for concern about the big picture. It was there, sketch it or kill it, stuff it and write it up. Why speculate about how it got there? With no commitment to medicine as a career, and no particular thoughts of any other, Darwin may quite simply have been unready for the full understanding of the studies offered to him. Yet his time at Edinburgh was not wasted, because he acquired there – despite his lack of enthusiasm - the basic skills of scientific investigation without losing his enthusiasm for natural history.

So much for the simple explanation. The other must wait for the next episode.

II. 'Silent, upon a peak in Darien'

For me, 11 January 2002 was very special. On that day I was in La Campana National Park, Chile, covering some of the territory that Darwin covered on 16 and 17 August 1834, experiencing for myself four separate aspects of the observational powers which were recorded in pages 208 to 211 of *Journal of Researches into the Geology and Natural History of the Various Countries visited by HMS Beagle.*

HMS Beagle, under the command of Robert Fitzroy (promoted from Commander to Captain during the voyage) circumnavigated the globe, setting out from Plymouth on 27 December 1831 and dropping anchor on her return to Falmouth on 2 October 1836. The purpose of the voyage was to complete the survey of the coast of southern South America. Darwin joined the ship as gentleman companion and naturalist, was not a member of the crew or under naval orders, and was financed by his father. *Beagle* spent spells of varying length surveying and in port, and at these times Darwin made expeditions on land: of the almost five years of the voyage only about eighteen months (533 days) were spent at sea by Darwin.

My main source has been the Penguin Classics edition of *Voyage of the Beagle:* in order to bring Darwin's work into a Penguin format it was necessary to shorten the text by about one-

third. On the voyage Darwin made 1383 pages of notes on geology, as compared to 368 pages on zoology. Passages that the editors thought would be 'unlikely to be missed' were excised. To give one example, the summary at the start of Chapter XII includes:

> Wolf-like fox – *Fire made of bones – Art in making fire – Manner of hunting wild cattle – Geology, fossil shells* – Valleys filled with great fragments, scenes of violence.

In the text the headings italicised are replaced by three asterisks. Most of the 'geology bit' has disappeared. This is particularly frustrating since Chapter XII was set in the Falkland Islands, where current research into the fossils is proving very interesting. There is the additional problem that Darwin's South American geology is observation recollected in a distant study. Darwin kept a detailed diary during the voyage but it was seven months after his return to England before this was published. *Voyage of the Beagle* appeared in 1839, three years after her return. Thus there was ample scope for reflection, and therefore what we read was most unlikely to have been what Darwin felt, or thought, on the spot. We can be sure that he was conscious that whatever appeared in print would be subject to close scrutiny.

Nevertheless, we can still make a qualitative assessment of Darwin's attitude towards 'deep time' from the *Voyage*, an assessment of what he wanted us to believe rather than what he actually did believe. Thus, in Chapter I, at Bahia in Brazil, he wonders: 'Can we believe that any power acting for a time short of infinity could have denuded the granite over so many thousand square leagues?' The way in which the narration continues raises the 'wood and trees' question. In Patagonia, for example, Darwin describes variations in beach levels, and variations in 12 species of shellfish in some kind of order – but no more. He lists fossil remains of 13 quadrupeds which 'co-existed during an epoch which, geologically speaking, is so recent, that it may be considered as only just gone by.' Near Bahia Blanca there is some observation of quartz, slate and a conglomerate, with a little mild speculation as to how the last was deposited, but little that one can seize upon. Near Montevideo he describes a section indicating successive deposition of clay and limestone, with marine remains shading off into an estuary deposit – but no timetable. Again in Patagonia, Darwin considers the formation of raised beaches, using such phrases as 'a long period of repose', 'periods of rest', 'insensibly rising', 'a steady but very gradual elevation' – descriptions so vague as to be almost meaningless. Within sight of the high peaks of the Cordillera, he describes the very varied size and composition of erratic blocks without any acceptable

explanation of their derivation. In the Falklands Darwin came across 'streams of stones' – 'periglacial blockfields' as we would now call them - which he described in meticulous detail, speculating as to their formation. Was this, he observes:

> a great arched fragment fairly pitched up in the air and thus turned? Or was this fragment the last vestige of an earlier surface whose debris have been shaken by innumerable earthquakes into one continuous sheet?

His conclusion, that 'never did any scene [...] so forcibly convey to my mind the idea of a convulsion of which in historical records we might in vain seek for any counterpart', seems to be groping around the idea that 'the present is the key to the past' - the idea of an enormously long time-scale.

By February 1834 the Beagle and Darwin had rounded the Horn and were at Valdivia, in Chile. Here, he was onshore when he experienced a severe earthquake, and on 4 March, at Concepcion, he observed the damage caused by 'the permanent elevation of the land' and the subsequent tsunami. This first-hand experience had a great influence on Darwin's thinking. He was beginning to come to terms with a world subject to long, slow processes operating over a long time scale, when he was presented with the proof that there were also catastrophic events resulting in

dramatic change. As we shall see, it was to take a long time for Darwin to reconcile properly in his own mind these seemingly contradictory processes and to appreciate that what appears to be, in human terms, a swift and violent catastrophe in geological terms is a tiny incident in a long, slow sequence of processes.

16 and 17 August 1834 are important in highlighting four aspects of Darwin's work and legacy. On these days Darwin ascended the Campana (or Bell mountain, 6,400 feet) in what is now La Campana National Park. He saw and gave a page to the Chilean Sugar Palm (*Jubaea chilensis*), which here forms the most southerly palm forest in the world (at 32' 57" south, 71' 05" west). 'Excessively numerous' in Darwin's time, its population has declined from 5 million to only 124,000 today. It is sobering to look around the National Park and see two-thirds of the world's population of this impressive tree, and to realise that some of the finest old specimens must have been seen, if not noticed, by Darwin on that special day.



Fig 6 – Chilean Sugar Palm (Jubaea chilensis)

Unusually, for whatever reason, Darwin says more about this one tree than any other single plant on his travels. His extended description of the methods used in the extraction of the sugar makes it clear to us that this was not a sustainable operation. We are familiar with Darwin the bug-hunter, the barnacle man; on La Campana he becomes the romantic traveller, revelling in the sunset, the bird song and the pleasures of the open air life. By day there is the splendid beauty of the Andes and the superb clarity of the air – the masts of the ships in the harbour at Valparaiso, 26 miles away, can be picked out – inspiring thoughts of the Sublime.

Darwin the observer and recorder was not idle, however. He noted that the summit of the mountain was made of huge angular fragments of basalt which 'presented every degree of freshness' and hypothesised about this and the later contrast with Mount Wellington near Hobart. Here also, Darwin finally began to make clear a commitment to the concept of 'deep time':

> Who can avoid admiring the wonderful force which has upheaved these mountains, and even more so the countless ages which it must have required, to have broken through, removed and levelled whole masses of them?

although a convoluted double negative (a reflection of uncertainty?) rather dilutes a later statement that all-powerful time can grind down mountains – even the gigantic Cordillera – into gravel and mud. Seven months later, in the same district, he wrote: 'These mountains have existed as a great barrier, since a period so remote[2] that whole races of animals must subsequently have perished from the face of the earth.' 30 April 1835 was the day on which Darwin had his own 'eureka moment', reminiscent of Playfair's account of Hutton's revelation at Siccar Point:

> It required little geological practice to interpret the marvellous story, which this scene at once unfolded, though I confess I was at first so much astonished that I could scarcely believe the plainest evidence of it.

Like Hutton, he enumerated each step in the evolution of the landscape of his time, concluding:

> Vast and scarcely comprehensible as such changes must ever appear, yet they have all occurred within a period recent when compared with the history of the Cordillera; and that Cordillera itself is modern as compared with some other of the fossiliferous strata of South America.

Back in Cambridge, John Henslow was Regius Professor of Botany. Thirteen years older than Darwin, he was Darwin's mentor, patron and scientific godfather. It was to Henslow that much of Darwin's collected material was despatched and Darwin constantly sought his approval. During the voyage he and Darwin corresponded and on 12 August 1835, in a long letter, Darwin revealed that some of his 'Geological views' had been 'subsequently to the last letter altered.' He believed that 'the upper mass of strata' were 'not so very modern' as he had supposed. Without mentioning a time-scale, he implies extremely lengthy processes: for instance, 'enormous streams of lava' alternating with 'sedimentary beds to a vast thickness', 'strata several thousand feet thick of coarse Conglomerate', 'alternations of compact crystalline rocks [...] and sedimentary beds, now upheaved, fractured and indurated.' Henslow read some of Darwin's letters to the Philosophical Society of Cambridge and had them printed for

private distribution. Small wonder that Darwin was circumspect in what he wrote. That Darwin was probably right to be tactful emerged much later when, in the aftermath of his *Origin of Species,* Henslow fell out with Darwin.

If Stephen Baxter is correct, it would seem that Darwin sailed on the *Beagle* with an outmoded set of ideas. Darwin himself attributed his development as a geologist to Lyell and his *Principles of Geology*. His *Journal* suggests a long period of gestation until he was prepared to declare publicly his acceptance of 'deep time'. We know how cautious, even diffident, Darwin could be. He sat on the *Beagle*-inspired ideas on the *Origin of Species* for many years before an imminent publication by Wallace forced him into action. Darwin avoided time-wasting and often contentious committees and the like (although he reluctantly took up the Secretaryship of the Geological Society).

At Cambridge Darwin had been on a course which would mean conformity with and eventual subscription to the 39 Articles of 1571. Whatever Darwin thought about deep time, he had to conform on the surface to the society around him. Many years later, the reaction of Adam Sedgwick to *Origin of Species* was*:* 'I have read your book with more pain than pleasure.' Reverend Professor Henslow (Mineralogy, 1822, Botany 1825) was made Rector of Hitcham in 1839. With mentors like these, it is understandable that Darwin felt it necessary to err on the side of

caution. It could be that Darwin was quite content to play the part of Expedition Naturalist, to record and collect, to send plant and animal material home, and, quite simply, keep out of areas where nothing but controversy would result.

I conclude this section by examining a series of episodes, on either side of the *Beagle* voyage and spread over eleven years, which others have described but do not seem to have considered worth commenting on, but which I find very difficult to understand.

Darwin was a favourite student of Adam Sedgwick, Professor of Geology and President of the Geological Society of London. In 1831 Sedgwick planned a visit to North Wales to clear up some problems of the region. Darwin, who 'worked like a tiger at geology', was taken along as assistant and pupil. The pair spent a week on fieldwork, working separately during the day and pooling their information in the evenings, trying to clarify what had happened in the area before the Old Red Sandstone was laid down. On this tour, as he called it, Darwin had a striking instance of how easy it was to overlook phenomena, however conspicuous, before they have been observed by anyone.

> We spent many hours in Cwm Idwall, examining all the rocks with extreme care, as Sedgwick was anxious to find fossils in them; but neither of us saw a trace of the wonderful glacial phenomena all around us; we did not notice the

> plainly scored rocks, the perched boulders, the lateral and terminal moraines. Yet these phenomena are so conspicuous that [...] a house burnt down by fire did not tell its story more plainly than did this valley. If it had still been filled by a glacier; the phenomena would have been less distinct than they now are.

Then, in South America, he came across the full expression of mountain glaciation – frost-shattered arêtes, corries, roches moutonnées, U-shaped and hanging valleys, ribbon lakes, moraines, erratics, outwash and the rest. In 1838 he had 'eight good days in Glen Roy', trying to solve the riddle of the Parallel Roads and coming up with an answer - which was, sadly, wrong - based on his South American experience. In 1842 he returned to North Wales. In his own words:

> Eleven years ago, I spent a whole day in the valley, where yesterday everything but the ice of the glacier was palpably clear to me, and then I saw nothing but plain water and bare rock.

The discovery of a tropical Volute shell in a gravel pit near Shrewsbury elicited from Sedgwick the remark that, had it been really embedded there, it would be the greatest misfortune to geology as it would overthrow all that we know about the superficial deposits of the midland counties. Darwin reacted thus:

'I was then utterly astonished at Sedgwick not being delighted at so wonderful a fact as a tropical shell being found near the surface in the middle of England.'

Darwin attributed his new clarity of vision to his reading - particularly Lyell; his own practical experience must also have contributed to his new understanding. His mentor, the Professor of Geology at the University of Cambridge and President of the Geological Society of London, failed to make the correct inference, despite the fact that the despised Jameson had already, in the 1820s, 'expressed the view in his lectures that glaciers had once existed in Scotland' (see McKirdy, Gordon and Crofts, *Land of Mountain and Flood: The Geology and Landforms of Scotland,* 2007)?[3]

An explanation for Sedgwick's myopia may be found in Patrick Geddes, who contributed an article on *Variation and Selection* to *Encyclopaedia Britannica.* Geddes probably had Darwin in mind when he stated that, pre-*Origin of Species,* there was 'a tendency to concentrate upon more concrete and smaller problems alone, since of these the solution was comparatively sure.'

In addition, Darwin was cautious in exposing his new thinking to the criticism of his influential mentor.

Part II

I. Charles Darwin and Patrick Geddes

> If one dropped in on a luncheon group at the faculty club of a metropolitan university and asked a dozen scholars: 'Who is Patrick Geddes?' there would probably be a dozen answers, and though some of the answers would be hazy, they would all, I think, be different; and one might get the impression that Professor Geddes is a vigorous institution, rather than a man.

Thus said Lewis Mumford, one of the leading planners of the first half of the 20th century and a disciple of Geddes. *Who's Who 1930* summed up Geddes's achievements in 334 words while the cover of Philip Boardman's *The Worlds of Patrick Geddes* and the memorial plaque placed on the site of the Geddes birthhouse in Ballater on 2 April 2008 both use the same description: 'Patrick Geddes – Biologist, Town Planner, Re-educator, Peace-warrior.'

The obvious question in relation to Patrick Geddes is, how did a young man from a very modest background in a small provincial city, with the sketchiest of qualifications, break into the upper echelons of the scientific society of his time? In trying to answer this, I shall examine Darwin's influence on the young

Geddes. Then I shall try to clarify Geddes's role in the dissemination and interpretation of Darwin's ideas.

The main source for Geddes's early years is Geddes himself, supplemented by the correspondence between John McKail Geddes, Patrick's brother who had emigrated to New Zealand, and the family back in Perth. In 1923 Geddes gave a series of lectures in the United States, which Mumford published in 1925 as six *Talks from My/The Outlook Tower* in *Survey*, a sociology periodical (having started as 'My Outlook Tower', the series became 'The Outlook Tower'). Of these, *The Education of Two Boys* is most interesting for the purpose of this study, and has proved to be the source upon which all writers on Geddes have drawn.

Geddes was seventy when he wrote the essay, in which he was trying to prove that his 'education of two boys' was the model. We know, of course, from experience how selective memory can be; in his case he was also physically far away from the scenes he was describing: 'As I revise this manuscript, our ship is running along the east coast of Sicily, between Messina and Catania.' When Geddes was 74 (in 1928), *Young Barbarian,* the Perth Academy school magazine, published *Memories and Reflections,* written at Montpellier. Again, we must be aware of the selectivity of memory dulled by time and space.

The two boys in the title are not Geddes's two sons, as one might suppose. They are Alasdair (the elder, killed in the First World War) and Geddes himself. He describes his childhood and upbringing on the slopes of Kinnoull Hill where 'the wise and gentle father' walked with him around the garden of Mount Tabor Cottage on the Sabbath. East of the Tay was a developing leafy suburb of Perth, ancient market and county town, major railway and textile centre. Geddes's father was a Quartermaster in the Militia, an officer promoted from the ranks, while all around were the big houses of the *gratin* of Perth.

At least two writers – not Scots - have referred to Geddes as the typical 'lad o' pairts' in Scottish history. In fact, he was nothing of the sort. Mount Tabor Cottage was no palace, but neither was it a but-and-ben. It had six rooms with one or more windows and the Geddes family were well enough off to keep a live-in servant. Certainly, in the years after Patrick had left home to seek his fortune, the family circumstances were quite comfortable.

Geddes described a close-knit family life. School was down the hill and across Smeaton's great bridge in Perth, not very close and there were probably few like-minded youngsters around Mount Tabor. The result must have been that Patrick was often a lonely little boy, spending most of his time with older people; he did write nonetheless that '[g]ames were enjoyed, especially the combative, from inter-scholastic snowfights to football, but cricket

seemed slow, and golf intolerably old and grownup.' As for formal schooling, Geddes's reminiscences were favourable and, given his objections to the 'cram-exam' system, remarkably conformist. He 'soon tired of Latin', had a good grounding in English, French, Chemistry and – especially – Maths, where he was very well taught, partly in the outdoors.

Young Patrick 'grew up in a garden'. He spent many hours rambling through the woods on Kinnoull Hill and there were long expeditions to the Highlands. There was learning by doing, planting potatoes, making a box and the like. He collected geological and botanical specimens to be examined and stored in his own laboratory at home. A day's excursion to Edinburgh opened his eyes to the excitement of Scotland's past. When he left school he had a spell working in the local bank, acquiring an understanding of what money could do, while maintaining an indifference to acquiring it for himself, which lasted all his life. Then came a period of 'home studies'. His father – remarkable for a Victorian parent - built for him a workshop and laboratory, when it seemed that adolescent mischief might develop into something worse. He had lessons on cabinet-making in the mornings, attended the School of Art in the afternoons and was encouraged to read voraciously.

At that time Perth had at least seven circulating libraries, as well as an array of good, serious libraries - a Public Library of

1786, a Mechanics' Library founded 1823, the library of the Literary and Antiquarian Society. The Perth Reading Society was another public library, of 1823. The Andersonian Institution (1847) had a library of several hundred volumes 'mostly of a scientific nature'. And there was an *Encyclopedia Perthensis* (1796-1806) in 23 volumes. The *Second Supplement to the Catalogue of the Perth Mechanics' Library* (1876) included *The Expression of the Emotions in Man and Animals*. By Charles Darwin. Illustrated. London, 1872. 1 volume, and *The Movements and Habits of Climbing Plants*. By Charles Darwin, MA, Illustrated. London, 1875. 1 volume. While Geddes had moved on by 1875 he was certain to have read *Expression of the Emotions*.[4]

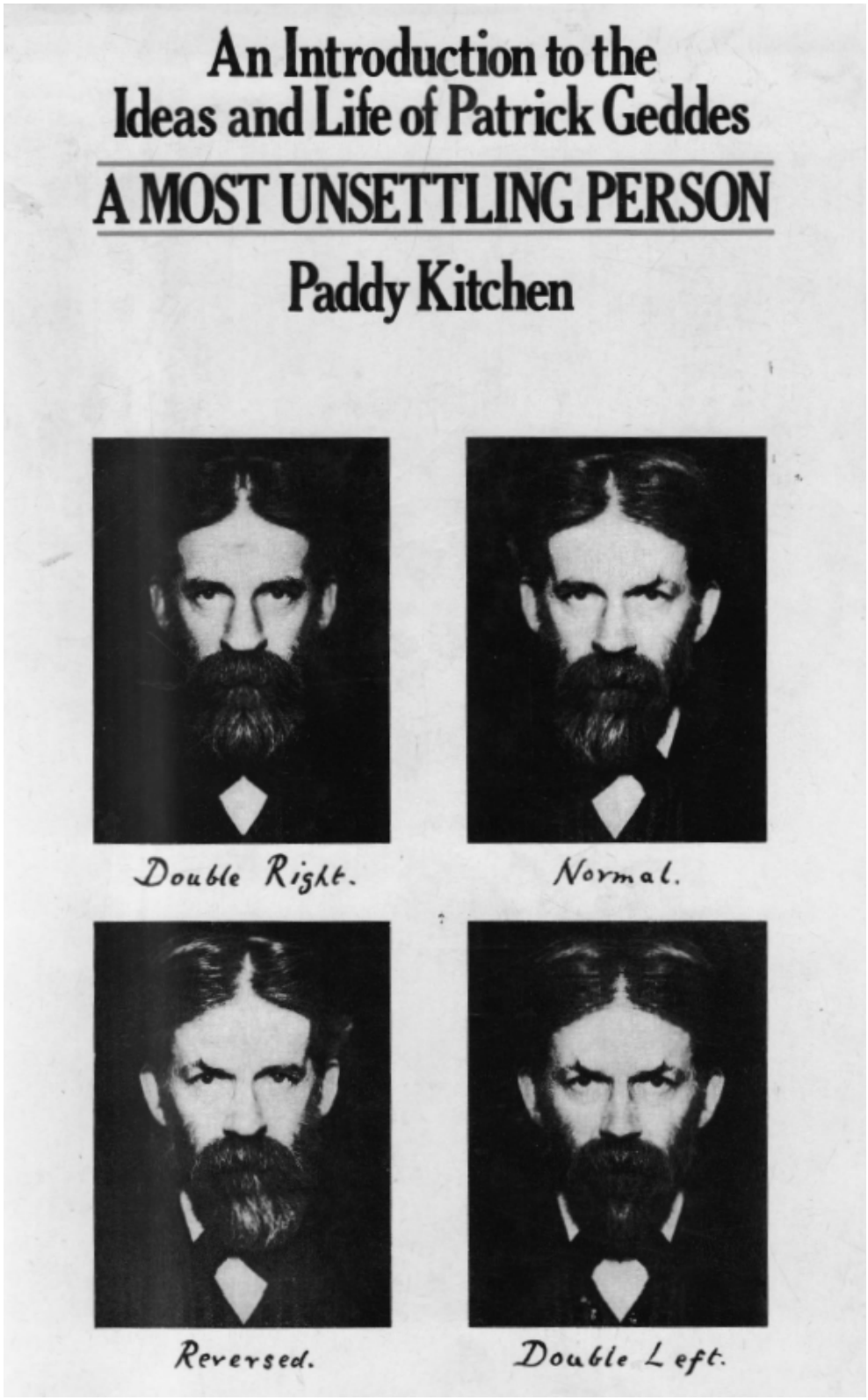


Figure 7 – Quadro-portrait of Geddes

Reading was a solitary occupation but the Perthshire Society of Natural Science must have influenced Geddes socially, as well as intellectually. The Society's minutes show that, on 5 January 1871, Carl Fleckstein, teacher of Modern Languages at Perth Academy, proposed Geddes's name to the Society and that he became a regular attendee. Later that year he left school and in 1872 he was voted on to the Library Committee. The minute of the Annual Meeting of 1872 records:

> The following books have been added to the library of the Perthshire Society of Natural Science –
> By purchase – *'Descent of Man'* – Darwin.

The Perthshire Society of Natural Science was no collection of rude mechanicals meeting in a back room. The President and moving spirit in the foundation of the Society of Natural Science was Dr Francis Buchanan White, a good enough biologist to have applied (without success) for the chair of Zoology at Owens College, Manchester, the kernel from which Manchester University grew. A later President was Dr James Geikie, Director of the Geological Survey in Scotland and author of *The Great Ice Age and its Relation to the Antiquity of Man.* When he moved on, it was to succeed his brother in the Murchison Chair of Geology and Mineralogy at the University of Edinburgh.

That the Society had a wide remit was demonstrated in the autumn of 1878 when Darwin was engaged in an interesting quadrangular issue. Thomas Vernon Wollaston (1822-1878) was a friend of Darwin with interests in insects and islands. He made five long trips to Madeira. The British Museum purchased his Madeiran Coleoptera collection. He made two trips to the Canary Islands, then visited the Cape Verde Islands. The trip to St Helena was his last. Having been sent material by Wollaston, Buchanan White published a paper on *Hemipterous fauna of St Helena* in the Proceedings of the Zoological Society of London. Buchanan White's paper (whose full title was *Contributions to a Knowledge of the Hemipterous Fauna of St Helena and Speculations on its Origin*) comprises 35 pages, plus a page of illustrations. In the Descriptive section of 16 pages he makes it clear that Wollaston, a few months before his death, handed over his collection to Buchanan White 'for determination', with directions that a 'set of types' be placed in the British Museum and that the new species be described in a single paper and not piecemeal. This had now been done with this paper. There followed lists and notes, with 7 new genera and 24 species named and described, with the authority Buchanan White. Several have the specific *sanctae-helenae,* there is also a *wollastoniana* and a *wollastoni.*

Part I is Speculative, and this is the source of controversy. In a letter dated 23 September1878 (from the Perthshire Society for

Natural Science Collection reproduced here by kind permission of Perth Museums and Art Gallery), Darwin commented on White's paper, as follows:

> Dear Sir,
>
> I have now read your paper, and I hope that you will not think me presumptuous in writing another line to say how excellent it seems to me. I believe that you have largely solved the problem of the affinities of the inhabitants of this most interesting little island, and this is a delightful triumph.
>
> Dear sir, Yours faithfully,
>
> Ch Darwin

Darwin suggested on 5 October that Hooker should read the paper; the outcome seems to have been a rejection by Hooker of White's explanation. That he replied to Darwin on 7 October seems to suggest that he had already read Buchanan White's paper and had made up his mind about it. (The *Beagle* had returned via St Helena. Darwin noted the imbalance between endemic and introduced plants – 52 and 746 respectively – and the massive environmental changes as a result of human intervention). This little interchange illustrates two points. First, in late Victorian times a provincial, mainly amateur, society could still play a role in the advancement of knowledge. Secondly, we can see here the

extent of Darwin's networks. Not only did he pursue his own lines of enquiry, he busied himself constantly with anyone prepared to be interested at home and in other countries. The regard the Society held for Darwin is shown by an entry of the Minute Book for 4 May 1882: 'Dr Buchanan White moved, seconded by the Secretary, that the Society record the regret it feels at the death of Dr Darwin the greatest Naturalist of the age.'

Geddes had undergone an education of 'Head, Heart and Hand' long before the advent of Dewey. He attended Edinburgh University for a week before rejecting what it had to offer. In rejecting the conventional way forward he demonstrated a remarkable self-confidence. Having been reading Thomas Huxley's 'lay sermons', he formed a 'burning desire' to study under Huxley in London. The next move was to the Royal School of Mines (from 1907 Imperial College of Science), where he had to do a probationary year before becoming, in his second year, 'something of a real assistant' to Huxley.

At the Royal School of Mines, Geddes soon pursued his own research. He discovered an error in Huxley's work. Generously, Huxley insisted that Geddes write a paper, with three plates, which Huxley presented to the Zoological Society as a correction of his work by a pupil. Huxley found a place for Geddes as a demonstrator at Kew and put him up for the Sharpe Scholarship at

University College. Here took place the first recorded meeting of Darwin and Geddes.

To this point there has been much of Huxley but scarcely a mention of Darwin. This is not surprising, given the relationship between Geddes and the two senior figures of contemporary biology. In 1872 the students of Aberdeen University proposed *Mr* Charles Darwin, *Professor* Huxley and eight others for election as Lord Rector. Darwin declined to participate on the grounds of ill health and T.H. Huxley was elected Lord Rector on 14 December 1872. Darwin was familiar to Geddes through his writings; otherwise he would have seemed a free spirit, with private means and with little involvement at a high level in important organisations (the exception being, as we have seen, the Secretaryship of the Geological Society). Huxley was however for two years Geddes's superordinate officer, as well as teacher, with whom he was in almost daily contact, who recognised his talent and pushed him forward in his career. Fortunately, Darwin and Huxley were close and in frequent communication and Geddes benefited from their association.

A crucial incident took place in J. Burdon Sanderson's laboratory at University College and was described by Geddes in 1931 as a 'vivid and memorable lesson in biology.' Geddes was filling in some spare moments by examining samples of pond-water through a microscope. The first slide revealed nothing much

of interest and he was about to get a fresh sample when someone gently pushed him aside. Darwin, who had come in unnoticed, looked in the barren microscope field without saying a word. Then he broke out:

> […] positively shouting for joy: 'I say! They're moving, they're moving! Sanderson! Sanderson! Come and see, they're MOVING! Look at that!'
>
> Was not here a vivid and memorable lesson in biology – this literally Pan-ic intoxication of ecstasy, in our oldest of veterans, greatest of masters, before this simplest spectacle of life?

Early in 1878 Geddes had 'a sharp illness' and was advised to take a holiday out of London. Huxley sent him to Roscoff and its marine laboratory station, to which he returned for a summer's work. Then came the Sorbonne and a week in Naples, studying their marine laboratory, towards which, in 1873, Darwin had contributed £75. On an invitation from Professor Cossar Ewart of Aberdeen, Geddes now established the Scottish Zoological Station at Cowie, south of Aberdeen, the first in Great Britain. Geddes's oldest brother was a banker in Mexico City and Geddes was now awarded £50 by the British Association to conduct palaeontological and zoological research in Mexico. He collected

crayfish for Huxley, assorted reptiles and crustaceans for the British Museum and specimens of flora for himself.

In Mexico, overwork and cumulative eye strain, exacerbated by the excessively bright sunlight, brought about a collapse in Geddes's health. For a time he was a blind invalid. Although he recovered, it was clear that he was no longer capable of putting in long hours at the microscope. Returning to Edinburgh, he had a succession of posts, more teaching than researching, in botany, zoology and natural history. He wrote voluminously and engaged in a variety of enterprises which might have been seen as career distractors. In 1879 he had applied (unsuccessfully) for the newly created Chair of Zoology at Queen's College, Manchester. He now cast around for similar posts which would reflect his growing competence and experience. In 1880 Geddes wrote to Darwin asking permission to copy figures for an article on *Insectivorous Plants* in *Encyclopaedia Britannica.* Having been sent a reprint of the article, Darwin, on 9 December 1881, wrote as follows:

> Dear Sir,
>
> You were so kind as to send me a few days ago your article in the *Encyclopaedia Britannica.* I have now looked through it and it seems to me wonderfully well done, and you have managed to give in the space a surprising amount of information.

> Permit me to add that I read with admiration your researches on the presence of chlorophyll in the animal kingdom.
>
> I remain, dear Sir, Yours faithfully,
>
> Charles Darwin.

James Geikie commented to Geddes on this exchange: 'I hear with very great pleasure what you say as to old Father Darwin. His letters are very precious...'

In 1882 Geddes applied for the Chair of Natural History in Edinburgh. Three weeks before he died, Darwin supported the application as follows:

> Down, 27th March 1882
>
> Dear Sir,
>
> I have read several of your biological papers with very great interest, and I have formed, if you will permit me to say so, a high opinion of your abilities. I can entertain no doubt that you will continue to do excellent service in advancing our knowledge in several branches of science. Therefore I believe that you are well fitted to occupy any chair of natural history, for I am convinced that example is fully as important as precept for students.

I remain, dear Sir, Yours faithfully,

Charles Darwin

Late in 1887 the Regius Chair of Botany at Edinburgh fell vacant. For Geddes this was the ideal chair in the ideal place and, for the fifth time, at least, he prepared his formal application. 'The Letter of 1888' is an impressive printed document of 100 pages. Thirty-five leading scientists from Great Britain and the continent wrote in support of Geddes. Darwin's letter of 1882 was re-used, as was Huxley's, which included the following paragraph: 'Mr Patrick Geddes was at one time a distinguished student of my class. I have a very high opinion of his abilities; and I am well aware that his knowledge is unusually varied and extensive.'

Testimonials, solicited and unsolicited, were received from 7 educationists, 10 physicians, physiologists and pathologists, 5 well-known former pupils, 23 university extension students at Dunfermline. A collective letter was signed by 56 colleagues. The bibliography listed 3 books and 42 papers; significantly, distracting titles on statistics, economics, capital and labour, cooperation versus socialism and John Ruskin were excluded. What happened to Geddes's monumental application is uncertain; Isaac Bayley Balfour was appointed to the Edinburgh chair. J. Martin White, a boyhood friend of Geddes, endowed the Martin White Chair of Botany at University College, Dundee. Geddes was

paid half the salary of a full-time professor, but taught for only part of the year while an assistant was paid to handle the rest. As Boardman says: 'Geddes could earn his academic cake in Dundee, so to speak, and eat it for three-quarters of the year anywhere else he wished.' Geddes could now enter a long period with a measure of status and modest security, but with the freedom to range around at home and abroad exploring the interests wider than biology that were now engrossing him.

How influential had Darwin been in helping Geddes to this significant position? Birth and upbringing were important; a secure, serious home with supportive parents, an older sister who devoted her time to supporting her talented younger brother, two enterprising older brothers who went out to seek their fortunes in Mexico and New Zealand – successfully. He had a good basic education which was enriched by the informal activities encouraged by 'the wise father' and the period of 'home studies'. In Perth was a network seriously interested in science, through which Geddes was able to meet Darwin through reading his books and discussing his ideas with fellow-enthusiasts - some of very high calibre.

In London, he first satisfied and then became a protégé of Huxley. The scene in Sanderson's laboratory started the second phase of the Geddes/Darwin relationship. There was the Grand Old Man of British science looking down Geddes's microscope and

whooping like a child. If at no other time, Geddes must have learned the importance of enthusiasm and admired the humility of a man great enough to unbend before others in the search for knowledge and understanding. Now Geddes had a loose association with Darwin. Huxley made available the first formal steps in Geddes's career but Geddes kept in touch with Darwin and it must have been known in the appropriate circles that here was a young man worth watching. The 'referee's report', although it was only one of several and did not produce the desired result, is quite a remarkable document. Despite the formality of the language of the period, it shows that Darwin really knew and approved of Geddes's work and believed him to have great potential. Darwin declined to support Dr Buchanan White's application to Owens College, on the grounds that he had no personal acquaintance with him. According to Melvyn Bragg's recent programme on BBC Radio4, 'In Our Time', when Dr Grant, of his Edinburgh days, now Professor Grant, applied for a post, Darwin refused to recommend him because of his homosexuality.

Critics of Geddes might say that Darwin knew Geddes too well – by alluding to 'several branches of science' he might have been sounding a warning bell about his spreading his talents too thinly. Or was he merely harping back to his own days at Edinburgh? The letter is dated 27th March 1882 and Darwin died on 19th April. It must have been one of the last pieces of business

he transacted before he died. Yet it is as carefully considered and clearly expressed as anything else he wrote. This surely typified 'the simple, childlike, painstaking, effective Charles Darwin, who established himself presently at the head of living English naturalists.'

II. Patrick Geddes and Charles Darwin

It is not easy to assess Geddes's success in repaying his debt by interpreting for the next generation Darwin's contribution to knowledge and understanding. Geddes was a prolific writer and a fluent talker, but a full understanding could only be achieved through careful study of his actions and activities. The combination of influences and experiences from many quarters makes it impossible to determine the precise source of his ideas. Certainly, Darwin was by no means the only influence on Geddes.

From Darwin himself Geddes formulated the Planning Model (the ever evolving study of reality tested periodically against public participation), for which he is hailed as 'Father of Planning'. Häckel of Jena offered the concept of the interaction between the organism and the environment, while Paris-born Henri Bergson identified the *élan vital* or creative impulse. From this Geddes identified the importance of intuition and impulsive action as a trigger for evolutionary mutation in sociological terms.

Auguste Comte argued that all sciences passed through a theological, then a metaphysical and then a positive or experiential stage. From him Geddes acquired an approach to the study of cities based on empirical research and inductive reasoning. The anarchists Kropotkin and Réclus purveyed mutual aid and cooperation. Réclus, a refugee from the Paris Commune, brought in Bakunin's confraternity for anti-authoritarian socialism, theosophists and the founder of the Ba'hai faith. Geddes tutored Annie Besant in biology in the evenings when he was at the Royal School of Mines. In India, she was involved in the Indian independence movement and drew Geddes into contact with Gandhi, who accepted Geddes's regional approach but did not share his enthusiasm for planting trees.

Most importantly, Geddes's ideas were embedded in a complex of practical projects: the Outlook Tower (at once college, museum and laboratory), summer meetings, exhibitions, conservative surgery, greening the environment, city plans in several countries, his Scots College in Montpellier, even masques and pageants. From such a welter of ideas and projects I have extracted Geddes's written comments about Darwin. As we shall see, Geddes started by being inspired by Darwin and his works, but moved on to reject some of the outcomes of Darwinism.

In the 1880s Geddes was trying to establish himself satisfactorily in the academic world, initiating various educational

and sociological schemes, getting married and starting a family. He did a great deal of writing, partly because he was an educator and communicator, and partly because it was paid. As he put it, '[h]ack work was obligatory for men of science without Darwin's deep pocket.' In April 1880 *Encyclopaedia Britannica*[5] commissioned an article from Geddes on *Insectivorous Plants* and over the next few years he contributed more articles to the *Britannica* and to *Chambers Encyclopaedia* (11 and 22 respectively). Geddes would have gained authority by having been asked to write for these prestigious publications; his contributions would have gained the authority of having been part of these great repositories of knowledge. His articles had a wide currency at a certain level of society for a considerable time; the 1923 edition of *Chambers Encyclopaedia* was the last to contain Geddes material.

The entry for *Darwin* is the obvious place at which to start. 'An English naturalist of the highest eminence' is the first statement and almost the last is: 'Darwin's knowledge was no less remarkable than his caution in statements.' Between come his background, his education, the *Beagle* interlude, his research and publications, his honours and achievements so that '[i]n 1859, Darwin's name became "familiar as a household word" to the mass of educated and semi-educated Englishmen', with the publication of *The Origin of Species,* which Geddes summarises in one monster sentence. Controversy, partial acceptance and

consequent changes are described in three lines. This is perhaps the best point at which to remind ourselves that the full title of Darwin's great book is *The Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life.* The first four words are bland enough; then a hint of controversy comes in with the next five words, while the second half of the title is outrageously contentious.

Darwinian Theory is a presentation of facts in a clear prose style, which Geddes sadly lost as he fell deeper and deeper into sociology. He gives an account of the history of the theory and an excellent summary of the arguments and the evidence within the *Origin of Species.* His summary of how Darwin's views were received by followers and opponents is equally balanced. He quoted Huxley – that not a single fact had been found that was 'irreconcilable with Darwinian theory' – but had to point out that this 'universal acceptance is not without its universally distributed exceptions.' He included Darwin's assertion that '[t]he theory of evolution by natural selection is no more inimical to religion than is that of gravitation', and quotes Darwin's *Envoy;*

> There is a grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms, or into one; and that [..] from so simple a

> beginning endless forms most beautiful and most wonderful have been, and are being, evolved.

Evolution is a substantial (7-page) summing up of answers from theology, philosophy, psychology, the social and physical sciences and concepts from astronomy, chemistry, geology and, above all, biology. Geddes warns of confusion between Evolution and Darwinism, and takes issue with Huxley and his well-known assertion that '[f]rom the point of view of the naturalist the world is on about the same level as a gladiator's show.' Given the complex relationship between Darwin, Robert Chambers and the latter's *Vestiges of Creation,* there is a piquancy in Geddes's reference - in *Chambers Encyclopaedia* - to Chambers:

> Wells in 1813 and Patrick Matthew in 1831 forestalled Darwin in suggesting the importance of natural selection, but their buried doctrines were of much less practical importance than those of Robert Chambers, the long unknown author of the *Vestiges of Creation* (1844-53). His hypothesis of evolution emphasised the growing or evolving powers of the organisms themselves, which developed in rhythmic impulses through ascending grades of organisation, modified at the same time by external

> circumstances acting with most effect on the generative system.

Let us stay for a moment with Huxley and Geddes's debt to him and, by implication, to Darwin. Geddes's chosen master provided a superb training and pushed him along a career path. Huxley 'could think, draw, speak, write, inspire, lead, negotiate and wage multifarious war against earth and heaven with the cool professional ease of an acrobat supporting nine people on his shoulders at once.' But Geddes had doubts that he was too much of a necrologist, too limited by skeletons. His students were not sent outside the laboratory to study living things, even though Kensington Gardens were just outside. On one occasion, after a particularly brilliant demonstration, Huxley was said to have mumbled, half to himself: 'You see, I should have been an engineer.' Geddes had doubts about the 'survival of the fittest' - Herbert Spencer's coinage replacing 'natural selection' - and Tennyson's 'Nature red in tooth and claw' from *In Memoriam*. *The Evolution of Sex* suggests that, as well as struggle, cruelty and selfishness in evolution, there is also cooperation, and 'that "creation's final law" is not struggle but love.' S.A. Robertson, a former student at Geddes's *Collège des Ecossais*, paid *'A Scottish Tribute'* on the death of Geddes in 1932:

> Even a noble soul like Huxley could see in life essentially a 'gladiator's show.' Geddes […] challenged the verdict in his books, in his lectures, in the flood of vivacious speech which leaped from him like a fountain. I recall the thrill which went through an audience as he traced the basal feature of all life to be the sacrifice of the mother for her offspring and closed by saying […] 'So life is not really a gladiator's show; it is rather – a vast mothers' meeting!'

In his *Evolution* entry for *Chambers*, Geddes produced examples suggesting that 'evolution is primarily a materialised ethical process'. With moral optimism, he concluded that:

> […] it is possible to interpret the ideals of ethical progress – through love and sociality, co-operation and sacrifice, not as mere utopias contradicted by experience, but as the highest expressions of the central evolutionary process of the natural world.

For the *Encyclopaedia Britannica* Geddes provided an 8-page article on *Variation and Selection*, the topic of *Evolution* having already been written up by another. *Vestiges of Creation* had gone through ten editions in ten years and the first edition of *The Origin of Species* was taken up on the first day. Geddes's concern was with

the determinant factors of evolution and the mechanism of the evolutionary process. He analyses *The Origin of Species* and the theory of Natural Selection and Variation under domestication and in nature. The struggle for existence is described and the survival of the fittest, he says, 'is unquestionably a *vera causa.*' Here Geddes is using 'true cause', or 'sacred cause' in the same sense as Desmond and Moore in entitling their book on *Race, Slavery and the Quest for Human Origins* 'Darwin's Sacred Cause'. Thus his conclusion is that the survival of the fittest is an important concept worth pursuing, but, in typically Geddesian fashion, he muddies the waters by immediately using 'cause' in a different sense. In the same article he denies that the existence of competition in nature and organic progress are respectively cause and effect.

Wallace and, particularly, Huxley are examined in some detail before Geddes covers Darwin's views on variation and notes how ideas on variation and natural selection were moving on rapidly, although 'natural selection seems more than ever to be our only possible clue.' After lengthy coverage of the Laws of Variation, Geddes concludes by repeating his cause and effect argument, and suggests that environmental and social factors also play their part in natural competition and progress. In particular, he argues that:

> The ideal of Evolution is thus an Eden; and, although competition can never be wholly eliminated, and progress must thus be asymptotic, it is much for our pure natural history to see no longer struggle, but love, as creation's final law.
>
> […]
>
> While ceasing to speak of indefinite variation we may of course still conveniently retain the rest of the established phraseology and continue to speak of 'natural selection' and of 'survival of the fittest,' always provided that […] we make the transition from the self-regarding to the other-regarding.

Other comments on Darwin crop up in some odd contexts. In *The Evolution of Sex* (1889, co-authored with J. Arthur Thomson [1860-1931]), the Darwinian conception of indefinite variation, brought about through the haphazard working of natural selection and resulting in an unlimited number of forms of life, is replaced by the restated theory of organic evolution. Certain definite laws of growth limit variation to definite forms so that evolution becomes an orderly, and even predictable, process. The two main forces are nutrition and reproduction: the desire to preserve self and the desire to perpetuate the species.

Every Man His Own Art Critic, written for the Manchester and Glasgow Exhibitions of 1887 and 1888, shows Geddes at his

most eclectic. In 58 pages he ranges around the science of colours, the art of seeing, criticism of individual paintings in the Exhibition, applying generous doses of biology and philosophy. Of a symbolic picture of *Pan and Psyche*, Geddes lyrically recalls that:

> although great Pan is dead his avatar (Darwin) was but lately with us to link anew the life of man and beast and grass. Shall we listen, as he did, to the complex piping of the old woodland Pan with an ear which strives to know its many notes and changeful melodies? Or shall our souls ever be lifted from the hurrying stream of vicissitude into the presence of the All?

Chapters in Modern Botany (1893) – Geddes's only textbook - has a throwaway remark about Darwin as a teacher. 'Were it worthy', he says of his little book, 'it should be dedicated to the memory of Darwin', and laments how hard it is to organise a morphological training that is 'truly Darwinian in spirit from the beginning.'

During the First World War Geddes used his Summer Meetings to organise his thoughts on 'Wardom' and 'Peacedom', published as a 20-page article in the *Sociological Review.* He saw the war as the logical outcome of nineteenth century Darwinism. British and German minds were dazzled by the 'impressive nature-myth' of tooth-and-claw competition, which Darwin and

his followers mainly saw in organic evolution. The whole trend of natural science and politics for half a century was based on half-truths and guided by colossal errors of interpretation. Darwin had read nature largely in terms of industrial conflict, of economic survival of the fittest and in turn, the industrialists and economists found in Darwin's projection of their system upon nature the justification for continuing in their ways. German scientists and Prussian imperialists subsequently adapted this British-industrial conception of evolution to their *Kultur* and their goal of world-dominion. And since 1914, the Prussian statecraft of brute force had openly been hurling this Darwinism of 'might is right' back at the Allies.

A last collaboration with J. Arthur Thomson resulted in *Life: Outlines of General Biology* (1931), a major farewell in which Darwin is praised as a lover and understander of nature. Geddes relates a favourite, and illuminating, anecdote.

Having invited some young scientists to his country home Darwin spent a whole evening 'questioning each and drawing him out on his subject; for no man was more open and eager to learn.' Then, leaning back on his chair, Darwin said:

> I am always feeling my ignorance, but never have I had it more strongly brought home to me than tonight. You have surprised me! – and again and again!. What

> you, (pointing in turn to each) know about cryptograms, and you tell me about phanerogams, and you about bacteriology, and you about embryology, and you about fishes, and so on, is most interesting! It's something astonishing! You do indeed make me feel my ignorance, and what I have missed!
>
> Pause: then jumping up from his chair, and with thump on table: 'But – damn you! – there's not a Naturalist in the whole lot of you!'

Darwin's influence on Geddes clearly operated at three levels. Like thousands of others, Geddes read Darwin and discussed his reading in a like-minded network. Secondly, they had a loose professional relationship, in which Geddes was the eager student and Darwin the benign sage. But the greatest influence, as spelt out by Geddes in some of the incidents already described at some length, was the demonstration of excitement and enthusiasm in the face of the natural world. How successful was Geddes in repaying the debt by interpreting for the next generation Darwin's contribution to knowledge and understanding? One could find out how many copies of the encyclopaedias were sold, but the question would then become how many read Geddes's contributions? And of these, how many

understood them? Geddes never wrote a bestseller. His books did well enough but were destined for a narrow readership. But, again, how many would have had time for the *Sociological Review* early in 1915 when the Great Powers were at war all across Europe and young men were queuing up to get into uniform?

Morningside Cemetery in Edinburgh is the resting place of many Victorians who sallied forth to set the world to rights and who came back to die in the land of their birth. On the tombstone of one of Florence Nightingale's followers is an epitaph which, suitably adapted, would sum up Geddes's role in promulgating Darwin's thinking: 'He did what he could.

'

Notes

[1] Wernerians were 'Neptunists', believing that all rocks were laid down under water. Jameson was clearly a Wernerian and on Salisbury Crags was taking a sly dig at the late James Hutton, author of *The Theory of the Earth*, as we have seen, and a Plutonist.
[2] Yet we, with the smugness of hindsight, know that the Andes are, in world terms, really rather young mountains; having developed only over the last 50 million years!
[3] See McKirdy, Gordon and Crofts, *Land of Mountain and Flood: The Geology and Landforms of Scotland*, 2007.
[4] Figure 7 shows the cover of *A Most Unsettling Person: An Introduction to the Ideas and Life of Patrick Geddes,* by Paddy Kitchen, reproduced by kind permission of the publisher, Victor Gollancz, an imprint of the Orion Publishing Group. While I (and they) have been unable to trace the source of the portrait, it very much looks as if Geddes had been dabbling in some of the ideas Darwin was concerned with in *Expression of the Emotions.*
[5] One of the spin-offs for Edinburgh from the Enlightenment was the establishment of a serious publishing industry. The first edition of the *Encyclopaedia Britannica* was completed in 1771 and expanded through various editions and owners until the ninth - 'Scholar's' - edition of 1875-89, the last to be produced in Scotland, with 1,100 contributors. William and Robert Chambers began *Chambers Encyclopaedia* in 1859. Aimed at a more popular market, it appeared in 520 weekly parts at 11/2d each and had over 100 distinguished contributors.

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ISSN 2041-8817
ISBN 978-0-9532713-6-8

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