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Science, Religion and the Environment in the Old Statistical Account of Scotland

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Submitted in fulfilment of the requirements for the
degree of Doctor of Philosophy

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Abstract

The thesis explores Church of Scotland ministers' interest and attitudes towards the natural environment. Starting with James Hutton's *Theory of the Earth*, presented to the Royal Society of Edinburgh in 1785, it questions why there was so little reaction from ministers to a theory that blatantly contradicted any literal reading of the Mosaic account of creation. The main source for the investigation is the Old Statistical Account, published in the decade following Hutton's *Theory*, containing 938 parish accounts, the great majority of which were written by Church of Scotland ministers. The parish accounts provide detailed descriptions of the natural environment offering the opportunity to explore ministers' interests and attitudes on a range of environmental issues. The thesis includes a literature review that sets out the context to the accounts. It also includes a discussion of the antecedents to the accounts, including the involvement of ministers in travel writing in the highlands. It goes on to explore the environmental contents of the accounts and how they varied across Scotland, drawing on a sample of parishes across the country, followed by a thematic analysis of the descriptions of flora, fauna and the physical environment contained in the accounts. What emerges from the study is a clergy interested and knowledgeable about the natural environment and some 'minister naturalists' who were expert. Educated in natural history and natural philosophy in Scottish Enlightenment universities, ministers were not shocked by Hutton's *Theory* or other developments in natural sciences. Rather, they embraced enlightenment values, were committed to 'improvement' and to a scientific understanding of the natural environment.

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Author's Declaration

I declare that, except where explicit reference is made to the contribution of others, that this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

ADRIAN SHAW

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Friends and family in Argyll and beyond, too many to mention individually, have helped sustain me throughout. Sadly, both my parents died during the preparation of this thesis. In their memory, I dedicate it to them.

List of Abbreviations

Fasti	Scott, Huw (ed.), <i>Fasti Ecclesiae Scoticae</i> , 7 vols, revised edition, (Edinburgh, 1915-1928)
FFRSE	Waterston, C.D. and A Macmillan Shearer, <i>Biographical Index of Former Fellows of the Royal Society of Edinburgh 1783-2002</i> (Edinburgh, 2006)
NSA	Gordon, John (ed.), <i>The New Statistical Account of Scotland</i> , 15 vols, (Edinburgh, 1845).
ODNB	<i>Oxford Dictionary of National Biography</i> (online) https://www.oxforddnb.com/
OED	<i>Oxford English Dictionary</i> (online) https://www.oed.com/
OSA	Sinclair, John (ed.), <i>The Statistical Account of Scotland</i> , 12 vols. (Edinburgh, 1791-1797)
RSE	Royal Society of Edinburgh

Chapter One: Introduction

2026 is the tercentenary of the birth of James Hutton (1726-1797) Edinburgh polymath, agricultural improver, and natural philosopher. His *Theory of the Earth* was presented to the Royal Society of Edinburgh in 1785. Arguing that the surface of the earth was shaped over immense periods of time by a continuing process of erosion, deposition and uplift, his theory contradicted any literal interpretation of the account of creation in Genesis. This apparent contradiction has suggested to some writers that Hutton's theory represented the start of a new science of geology and was a significant milestone in the progress of science against religion. A recent source, the website created in 2024 for the James Hutton tercentenary, repeats the claim:

His theory liberated science and philosophy from biblical chronology which put the earth at 6000 years old, and was profoundly believed in at the time.¹

The initial impulse for this thesis was to examine the evidence supporting such claims. Did Hutton liberate science and philosophy from the bible and did ministers believe that the earth was 6,000 years old? If these claims have substance how did the Church of Scotland and its ministers respond? The place where a response might be expected was the General Assembly of the Church of Scotland, where ministers, elders and others met annually in May to debate and decide of issues of policy and church law. However, the official record, the Acts of the Assembly, was silent on Hutton and his *Theory*, as was the unofficial record of the debates, the news reports published in *The Scots Magazine*. Commissioners to the General Assembly were not slow to criticise those of whom they disapproved and controversies, such as slavery, or the rights of heritors to appoint ministers over the wishes of congregations, were debated at length; but upon Hutton they were silent.

To investigate the response of ministers to Hutton's *Theory*, there is a timely source in the publication of *The Statistical Account of Scotland* in the following decade. Commissioned by Sir John Sinclair after the General Assembly of May 1790 the

¹ James Hutton Founder of Modern Geology (the website of the Hutton Tercentenary 2026), accessed April 2025: <https://james-hutton.org/>.

accounts cover every parish in Scotland. They contain an unparalleled source of information about Scotland's parishes and about the interests of the principal authors of the accounts, the parish ministers. Often referred to as the Old Statistical Accounts (OSA) to distinguish them from the New Statistical Accounts (NSA) of the 1830s and 1840s, they offer an opportunity to examine in fine detail what individual ministers were writing about the natural environment and how, if at all, they responded to Hutton's *Theory*. A close study of the accounts formed the main empirical work of this thesis, and this close study reshaped the course of the research.²

In the accounts there are a very small number of important, if veiled, responses to Hutton but a far larger number of ministers who wrote with enthusiasm about related subjects, including minerals, landforms, and earth history. Many ministers wrote about flora and fauna, and the great majority of ministers wrote an account of the farming and soils of their parishes. The detailed descriptions of the natural environment in the OSA provide a treasure trove of information and prompted further questions: why did Church of Scotland ministers write such detailed accounts of the natural world, what do the accounts tell us about their attitudes towards the natural environment, and what influenced their interests and attitudes? These questions helped to reshape the thesis, leading to the title 'Science, Religion and the Environment in the Old Statistical Account of Scotland'. Ministers' response (or the lack of it) to Hutton is set within these larger questions.

The thesis examines how ministers responded to the natural environment. It explores how their response was shaped by a number of factors, including the Scottish Enlightenment, the education of ministers in Scottish universities and their experiences as parish ministers. It describes, with examples, what ministers were writing about the natural environment and its exploitation, as recorded in the OSA. It concludes that the OSA demonstrates that Church of Scotland ministers were

² This study does not attempt to follow the story into the nineteenth century or study the information contained in the New Statistical Accounts. In part this is for the practical reason that the OSA provide more than enough data for one study, but it also reflects the rapid changes that took place in the early nineteenth century, particularly around the transmutation of species and subsequent theories of evolution, which created a challenging new source of debate.

interested and knowledgeable about the natural environment and that some were expert. This argument is developed as follows.

Chapter two sets out the context of the research by reviewing literature on ministers and the enlightenment in Scotland and in the wider world, on the relationship between science and religion, and on the role of the Church of Scotland in the moderate Scottish Enlightenment. Chapter three examines the education of Church of Scotland ministers and assesses their commitment to science as evidenced by their involvement in smallpox inoculation, and as founding members of the Royal Society of Edinburgh.

Chapter four describes the antecedents to the OSA, including the involvement of ministers in travel writing, and the relationship between Sir John Sinclair and ministers in the writing of the accounts. Chapter five explains the method used to identify environmental subjects in the OSA and summarises the environmental contents of the accounts from six sample areas across Scotland, demonstrating how those contents varied according to location. Chapter six looks at the descriptions of flora and fauna in the accounts, exploring what they reveal about ministers' attitudes towards species and habitats, including trees, woodlands, flowers, animals, birds and fish. It discusses bird migration, a subject of interest to many natural historians, and attitudes towards pest species or 'vermin'. Chapter seven examines the descriptions of the physical environment including climate, minerals, fossils, soils and earth history. It also notes the use of picturesque, sublime and romantic language in some accounts. Chapter eight identifies ministers who wrote outstanding accounts of the natural environment with the work of six leading 'minister naturalists' described in detail. One aim of this thesis is to describe and celebrate the work of such 'minister naturalists'.

Terminology

This section introduces, and offers definitions for, the main terms used in the title of the thesis: science, religion and the environment.

Science

The Oxford English Dictionary includes ten definitions of the term ‘science’, charting changes in use from the fourteenth century to the present day. An early definition was ‘The state or fact of knowing; knowledge or cognizance of something; knowledge as a personal attribute’.³ This general meaning became more specific in the eighteenth century by which time, as Matthew Eddy has shown, ‘science’ had come to be understood to mean knowledge about a specific subject that had been organised and ordered into a system.⁴ Knowledge of the natural world fell into many different categories each of which could be organised and systematised as a science. Golinski has described how, in the second half of the eighteenth century, one such natural science (chemistry), developed both as an academic subject in Scottish universities and as a public science.⁵ Science, according to Golinski, was part of the public culture. It is argued in this thesis that Church of Scotland ministers, almost all of whom were educated in Scottish universities, were part of this culture and that their writings in the parish accounts demonstrate their interest in science.

Ministers’ participation in public science was not uncritical. As discussed in the chapters below, the accounts in the OSA reveal that many ministers were comfortable with an empirical approach but sceptical about theory. In Scotland the empirical study of the natural world (natural history) was taught in universities as part of the arts degree, for example in Edinburgh University by John Walker, Church of Scotland minister and Professor of Natural History. Matthew Eddy has described how this empirical approach, stressing observation, description and classification, was imbued in the teaching of natural history in Scottish universities.⁶ This was reinforced in the 1790s by ‘theophobia gallica’ a suspicion of theories that might be associated with revolutionary France.⁷ Natural philosophy was also taught in Scottish

³ Entry for ‘science’ in the OED online: <https://www.oed.com/>.

⁴ Matthew D. Eddy, *Media and the mind: art, science, and notebooks as paper machines, 1700–1830* (Chicago, 2023), pp. 37–39.

⁵ Jan Golinski, *Science as Public Culture* (Cambridge 1992), esp. chapter 2: ‘The Study of a Gentleman: Chemistry as a public science in the Scottish Enlightenment’, pp. 11–49.

⁶ Matthew D. Eddy, *The language of mineralogy: John Walker, chemistry and the Edinburgh Medical School, 1750–1800* (Farnham, 2008), especially introduction, pp. 1–15.

⁷ Thomas Ahnert, *The Moral Culture of the Scottish Enlightenment, 1690–1805* (New Haven, 2014) p. 12.

universities, for example by John Anderson, Professor of Natural Philosophy at Glasgow University from 1757 to 1796. Natural philosophy was dominated by the legacy of Isaac Newton and was mathematical and more theoretical in approach than natural history. Science in this thesis, therefore, is understood to mean the organised study of the natural environment by both empirical and theoretical approaches.

Religion

The thesis draws on the writings of Presbyterian ministers of the Church of Scotland principally, but not exclusively, as contained in the OSA. As a source the OSA gives little information on ministers' theology. Rather, it sets out ministers' responses to questions directed at them by Sir John Sinclair, questions that focused on the state of the parish rather than ministers' beliefs. The thesis does not attempt to explore in any detail the theological background of ministers, which is beyond the scope of the study, or the party divisions within the Church, but a short introduction to the 'moderate' clergy can help to set the scene. Stewart Brown explained that the moderate party flourished in the Church of Scotland from 1730 to 1830 as 'a sustained effort by a group of ministers and lay leaders to adapt reformed theology to the distinctive flowering of intellectual culture that would later be termed the Scottish Enlightenment'.⁸ The development of a moderate clergy as a response to enlightenment thinking was elaborated by Richard Sher and others including Alexander Dick and Thomas Ahnert.⁹ Ahnert described how the moderate clergy positioned themselves between doctrinal orthodoxy and revivalist Enthusiasm and were as concerned as much about behaviour as doctrine:

This is the change of emphasis in much of eighteenth-century thought from theological doctrine to moral conduct as the true measure of religious belief. It was thought increasingly that a sincerely pious person was distinguished not by the precise creeds he or she professed, but by practical acts of virtue and a good character.¹⁰

⁸ Stewart J. Brown, 'Moderate Theology and Preaching c.1750–1800', in *The History of Scottish Theology*, vol. 2, eds. David Fergusson and Mark W. Elliott (Oxford, 2019) p. 69.

⁹ Richard B. Sher, *Church and University in the Scottish Enlightenment: The Moderate Literati of Edinburgh*, Edinburgh University Press (Edinburgh, 1985); Alexander Dick, 'Moderate Enlightenment and Religious Controversy in Eighteenth-Century Scotland', *Eighteenth Century*, vol. 58 (2017), pp. 503–508.

¹⁰ Thomas Ahnert, *Scottish Enlightenment*, p. 2.

More bluntly, Colin Kidd described the moderate clergy as the ‘Scottish Enlightenment at prayer’, a description that stresses their attachment to secular enlightenment values.¹¹ The moderate clergy attracted criticism from a variety of sources. Their opponents in the Church were collectively referred to as the popular party, a grouping that included traditional Calvinists, who were sometimes referred to as ‘orthodox’ and sometimes as ‘auld lights’. This group also included evangelical ministers as well as enlightenment luminaries such as John Witherspoon.¹²

In general, their opponents believed that the moderate clergy were too secular and that they were theologically deficient. This criticism would be made explicit at the Disruption of 1843 by William Hetherington, a Free Church minister at Torphichen and a church historian. Writing just before the Disruption he looked back on the moderates of the eighteenth century as: ‘a party who did not scruple to subject every spiritual consideration to the arbitrary rules of secular policy’.¹³ On the theology of the moderates, Hetherington was damning ‘The Church of Scotland, wherever thorough Moderatism prevailed, seemed spiritually dead, and all Christians withdrew from its polluting touch’.¹⁴ Hetherington was a leading figure in the Disruption and later professor at the Free Church College in Glasgow, so not impartial, but he did highlight a criticism of the moderate clergy repeated elsewhere: that they were too closely aligned with secular enlightenment values. Whether these deep differences in outlook between the moderates and their opponents within the Church of Scotland affected attitudes towards the natural environment is not clear but the limited evidence of the OSA seems to suggest that interest in the natural environment transcended these theological boundaries. This evidence is discussed in chapter five below.¹⁵

¹¹ Colin Kidd, ‘Subscription, the Scottish Enlightenment and the Moderate interpretation of history’, *The Journal of Ecclesiastical History*, vol. 55 (2004), p. 503.

¹² John McIntosh, *Church and Theology in Enlightenment Scotland: The Popular Party, 1740–1800* (East Linton, 1998).

¹³ William Hetherington, *History of the Church of Scotland, from the Introduction of Christianity to the Meetings of the Commission of the General Assembly in August 1841* (Edinburgh, 1843), p. 363.

¹⁴ William Hetherington, *History of the Church of Scotland*, p. 377.

¹⁵ A detailed study of the impact of doctrinal differences on attitudes towards the natural environment across Scotland goes beyond the scope of this study and the evidence in chapter five is confined to presbyteries in the county of Ayr alone.

There were clergy from a variety of other denominations in Scotland including Episcopalian, Catholic and Secession ministers (that is ministers of congregations that had left the Church of Scotland for doctrinal or other reasons). This study focusses on Church of Scotland ministers, who were the principal authors of the OSA.¹⁶ Clergy from other denominations were not represented in the writing of the OSA and therefore their views cannot be ascertained from a study of the OSA.

Environment

The natural environment is a broad concept consisting of the earth, water and air and all the living organisms contained therein. This definition follows that adopted by Richard Oram in his study of Scotland in the Little Ice Age, currently the most comprehensive exploration of Scotland's environmental history in the eighteenth century.¹⁷ To make such a broad definition manageable in this thesis, it has been necessary to subdivide it into different subjects, not all of which could be considered. In the thesis, the natural environment has been considered to mean the physical environment (rocks, minerals, soils, climate, etc.) and living organisms (flora and fauna).

Much of the interest of the accounts lies in their detailed descriptions of human management of the natural environment through agriculture, fishing, mining and other activities. Jonsson has described how environmental management in the highlands was shaped by enlightenment thinking, and the OSA provides voluminous evidence to explore this theme across Scotland as a whole.¹⁸ Agriculture, and its 'improvement', were a practical expression of enlightenment thinking. While agriculture is not the principal subject of the thesis, it is an important subject because of its huge environmental impact, for example on soils, woodlands and treatment of pest species. Principally for reasons of space, domesticated animals

¹⁶ Of the 938 accounts in the OSA, sixty nine were written wholly or in part by contributors who were not the parish minister. The majority of authors of these sixty nine accounts were anonymous. There do not appear to have been any accounts written by Episcopalians or ministers of other denominations.

¹⁷ Richard D. Oram, *Where Men No More May Reap or Sow: The Little Ice Age, Scotland 1400–1850* (Edinburgh, 2024). There is a discussion of the impact of the Little Ice Age in the section on climate and weather in chapter seven,

¹⁸ Jonsson, Fredrik Albritton, *Enlightenment's Frontier: The Scottish Highlands and the Origins of Environmentalism* (New Haven, 2013).

and crops have not been discussed. Similarly, coal mining is an economic activity rather than a strictly environmental subject, but it had important, and growing, environmental impacts. Moreover, in coalfield parishes, mines also provided ministers with insights into the geology underlying their parishes. For these reasons coal and other minerals have been included in the discussions. To help understand the context to the accounts in the OSA, enlightenment ideas about scarcity, and cornucopian or Malthusian views of the natural environment have been incorporated into the discussion where they throw light on ministers' attitudes.¹⁹

To keep the thesis manageable other subjects have been excluded. These include antiquities and the study of the remains of past human activity. Such ancient sites occur widely across Scotland and were subject to frequent comment by ministers. Unlike farming or mining however, they had limited environmental impact. Also excluded is any discussion of the mythical or spiritual landscape. Walsham has described the desecralisation of the British landscape associated with the Reformation in the sixteenth and seventeenth century.²⁰ In the OSA, descriptions of sacred places in the landscape were often noted as 'superstitions' suggesting that for ministers, if not their congregations, such ideas lay firmly in the past and were no longer important. Following on from this definition of environment, chapter five examines the principal environmental subjects identified by ministers in a sample of areas from across Scotland. Chapters six and seven discuss, with detailed examples, descriptions of the flora, fauna and physical environment written by ministers in parish accounts from across Scotland.

Spelling and Referencing: People, Places and the Natural World

The spelling of many names in the accounts is variable, including the names of people, places, flora, fauna and minerals. For example, the account of Kirkliston was written by 'John Muckarsie' who in the Fasti appears as 'John Mackersy' with a note suggesting an alternative spelling of 'Muckersey'.²¹ The author of the account of St.

¹⁹ Frederik Albritton Jonsson and Carl Wennerlind, *Scarcity: A history from the origins of capitalism to the climate crisis* (Cambridge MA, 2023).

²⁰ Alexandra Walsham, *The Reformation of the Landscape: Religion, Identity and Memory in Early Modern Britain and Ireland* (Oxford, 2011).

²¹ Kirkliston, County of Edinburgh, OSA, vol. X, 1794, pp. 68-77; Fasti, vol. I, p. 180.

Quivox near Ayr is ‘Mr. M’Quae’ who is listed in the Fasti as ‘William McQuhae’.²² The spelling of place names is similarly variable with examples being Air/Ayr, Turriff/Turreff and Argyll/Argyle. The spelling of Gaelic names was also variable and in Assint/Assynt the minister, William Mackenzie admitted his own limitations:

The writer of this paper informs once for all, that he is not such an adept in the Gaelic language, as to use Irish orthography; therefore, when Gaelic words must necessarily be mentioned, that mode is all along adopted, wherein there are few, if any, quiescent letters.²³

The spelling of Gaelic place names could be a challenge for ministers whose first language was not Gaelic as it was for the mapmakers of the Ordnance Survey in the nineteenth century, who recorded names, as they understood them, in place books.²⁴ Work to revise and correct Gaelic place names on maps and elsewhere has continued from then until the present day.²⁵

Wherever possible the spelling in the statistical accounts has been adopted without attempting to modernise it. This can lead to inconsistencies when referencing the accounts using the online Edina website of the OSA.²⁶ For example, in the Edina website of the OSA the account for the parish of ‘Morbattle’ is indexed as ‘Morebattle and Mow’.²⁷ For ease of reference, footnotes in this thesis relating to the statistical accounts follow the format adopted of the Edina website, including the volume numbers in Latin numerals, as do references to the Fasti. Other references use Arabic numerals.

The naming of species and minerals is also variable. Some ministers provided species lists that include local or Gaelic spellings. John Stuart’s account of Luss included a list of ‘wild animals’ with the names of species in Latin, English and, in some cases, Scots and Gaelic.²⁸ Fish species were listed under a bewildering range

²² St Quivox, County of Ayrshire, OSA, vol. VII, 1793; Fasti, vol. III, p. 66.

²³ Assynt, County of Sutherland, OSA, vol. XVI, 1795, p. 163.

²⁴ Ordnance Survey place name books can be found on the Scotland’s Places website: <https://scotlandspplaces.gov.uk/digital-volumes/ordnance-survey-name-books>.

²⁵ Ainmean-Àite na h-Alba, *Gaelic Place-Names Policy* (Sleat, Isle of Skye, 2020).

²⁶ The Edina website (<https://stataccscot.ed.ac.uk/>) contains facsimile reproductions of both the old and new statistical accounts. An introduction to the website and its use is given in chapter four below.

²⁷ Morebattle and Mow, County of Roxburgh, OSA, vol. XVI, 1795, pp. 504-512.

²⁸ Luss, County of Dumbarton, OSA, vol. XVII, 1796, pp. 246-253.

of names and reference to a glossary can be useful.²⁹ Rocks and minerals were likewise given different names before a systematic description of Scotland's geology was attempted in the nineteenth century.³⁰ While this inconsistency of naming the natural world can be frustrating it also indicates the diversity and richness of local traditions in the late eighteenth century. The standardisation of names by travellers and researchers is now also recognised as part of the colonial process and has been revisited as part of the process of 'decolonising' research in botany and in geology.³¹ Maintaining or reinstating indigenous names of places, species or minerals is important in this context. For these reasons the use of names as written in the accounts has been maintained wherever possible.

²⁹ Robert A. Watt, *A Glossary of Scottish Dialect Fish and Trade Names* (Aberdeen, 1989).

³⁰ John Flett, 'The first geological map of Scotland' *Transactions of the Edinburgh Geological Society*, vol. 13 (1936), pp. 291-303.

³¹ See for example Kelsey Leonard, 'Decolonizing botanical gardens', *Qualitative Research Journal*, vol. 24 (2024), pp. 536-554; Steven L. Rogers, Lisa Lau, Natasha Dowey, Hinna Sheikh, and Rebecca Williams, 'Geology uprooted! Decolonising the curriculum for geologists', *Geoscience Communication*, vol. 5 (2022), pp. 189-204.

Chapter Two: Ministers, the Enlightenment and the Environment

The purpose of this chapter is to explore the context in which Church of Scotland ministers were writing statistical accounts. It is organised into three parts. The first part examines science and religion, including the literature about natural history and natural philosophy. The second part explores the literature about James Hutton and his place within the history of earth sciences. The third part examines the Scottish Enlightenment and how the clergy were closely involved in its development. The review necessarily cuts across traditional subject boundaries and so requires an interdisciplinary approach including literature from natural history, biographies of Hutton and studies of the Scottish Enlightenment. It concludes by identifying significant gaps in the literature about ministers' interest and knowledge of the natural environment.

Science and Religion

Historians of science agree on one issue: there was no systematic or structural antagonism between science and religion in the eighteenth century. Rather there was a complex relationship that developed as circumstances changed and as new discoveries or theories emerged. John Hedley Brooke has explored the relationship in several publications.¹ He has identified three competing narratives that have been used to describe the relationship. In the first, science challenges religious belief, and slowly overcomes religion to become dominant. The second narrative suggests complementarity, with science and religion occupying different and separate realms; and the third that there was a more complex relationship with religion sometimes supporting the development of science and at other times offering challenges.²

Peter Harrison noted that the first of these, the conflict myth, is largely the invention of the late nineteenth century, particularly in the contributions of John Draper's

¹ John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge, 1991).

² Brooke, *Science and Religion*, pp. 2-5; see also John Hedley Brooke and Geoffrey Cantor, *Reconstructing Nature: The Engagement of Science and Religion* (Edinburgh, 1998).

History of the Conflict between Religion and Science, and Andrew Dickson White's *A History of the Warfare of Science with Theology in Christendom*.³ Harrison cautioned about the risks of retrofitting current controversies on to the past, advice which has not stopped a range of publications advancing the conflict theory. Among the most popular has been that of Richard Dawkins, an evolutionary biologist, whose *The God Delusion* has been reported to have sold over three million copies.⁴ Other authors advancing the conflict theory include Christopher Hitchens, a journalist, who published *God Is Not Great: How Religion Poisons Everything*, and Daniel Dennett, a philosopher whose *Breaking the Spell: Religion as a Natural Phenomenon* is a more nuanced critique of religious exceptionalism.⁵ The second narrative is illustrated by Stephen Jay Gould, a palaeontologist, who argued that science and religion occupy 'non overlapping magisteria', realms of thought that can coexist but have different intentions and methods of reasoning.⁶ This concept has been attacked by Dawkins and other critics of religion but received with less hostility by some theologians.⁷

The third narrative suggested by Brooke represents the mainstream position of historians of science. There is 'so extraordinarily rich and complex a relationship between science and religion in the past that general theses are difficult to sustain'.⁸ This suggests that any discussion of the attitudes and interest of Church of Scotland ministers towards the natural world and their response to the discoveries and theories of the earth must take account of the specific context in which they were writing.

Reijer Hooykaas, in a study of science and religion in the sixteenth and seventeenth century concluded that religion, particularly reformed religion, helped create a milieu in which science could flourish.⁹ Hooykaas described how the idea of the world as a

³ Peter Harrison, *The Cambridge Companion to Science and Religion* (Cambridge, 2010,) p. 4; John William Draper, *History of the Conflict between Religion and Science* (London, 1875) and Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom* (New York, 1896).

⁴ Alison Flood, 'Richard Dawkins to give away copies of *The God Delusion* in Islamic countries', *The Guardian*, 20 March 2018.

⁵ Richard Dawkins, *The God Delusion* (Boston, 2006); Christopher Hitchens, *God is not Great: How Religion Poisons everything* (Toronto, 2008); Daniel Dennett, *Breaking the Spell: Religion as a Natural Phenomenon* (London, 2006).

⁶ Stephen Jay Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York, 2011).

⁷ See Michael Gallagher, 'Revisiting the New Atheism', *Studies: An Irish Quarterly Review*, vol. 101 (2012), pp. 57-68; and Gregory R. Peterson, 'Whose evolution? Which theology?' *Zygon*, vol. 35 (2000).

⁸ Brooke, *Science and Religion*, p.6.

⁹ R. Hooykaas, *Religion and the Rise of Modern Science* (Edinburgh, 1972).

mechanism, endowed with properties by God, emerged in writings from Copernicus to Newton and how the empirical investigation of the natural world was a legacy of Francis Bacon and John Locke.¹⁰ Bacon distrusted ‘preposterous philosophies’ and encouraged the empirical study of nature ‘with humility and veneration’.¹¹ This led Hooykaas to suggest that Christianity and the emancipation of natural science went hand in hand. More recently, Peter Harrison has gone further, suggesting that science was dependant on religion for its success in the century following the foundation of the Royal Society of London in 1660.¹² The study of natural history thus presented an opportunity to ministers to understand nature, supported by reformed theology. Paradoxically, in Hooykaas’ analysis, humility in the face of nature became associated with greater confidence in the possibility of dominating nature, through the application of new, empirically derived scientific knowledge.¹³

A further development of importance associated with the early years of the Royal Society of London was the emergence of ‘aesthetic natural theology’. Alexander Wragge-Morley has explored how fellows of the Royal Society including Robert Boyle, Robert Hooke, and John Ray understood that their exploration of the natural world was not just an analytical activity but also one that could also offer emotional pleasure and spiritual insight. An example was the drawings of minute life forms observed under the microscope by Robert Hooke and published in *Micrographia* in 1665.¹⁴ Hooke believed that the beauty of the microscopic organisms he was describing was a consequence of their design by God: ‘The belief that God was an infinitely wise, powerful, and benevolent creator led Hooke to expect not only that natural things would exhibit a high degree of perfection in their design but also that they would be beautiful.’¹⁵ This background is important in understanding how religion, science and appreciation of natural beauty developed together. In Scotland similar developments in the eighteenth century, together with the foundation of the

¹⁰ Hooykaas, *Religion and the Rise of Modern Science*, p 13.

¹¹ Hooykaas, *Religion and the Rise of Modern Science*, p 39.

¹² Peter Harrison, ‘Religion, the Royal Society, and the Rise of Science’, *Theology and Science*, vol. 6 (2008), pp. 255-271.

¹³ Hooykaas, *Religion and the Rise of Modern Science*, pp. 67-69.

¹⁴ Robert Hooke, *Micrographia: or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses, With Observations and Inquiries Thereupon* (London, 1665).

¹⁵ Alexander Wragge-Morley, *Aesthetic science: representing nature in the Royal Society of London, 1650-1720* (Chicago, 2020).

Royal Society of Edinburgh helped shape the interests of Church of Scotland ministers, as discussed in chapter three below.

The Development of Earth Science

It is in this context that the growth of interest in the earth, its landforms and its history can be understood. Martin Rudwick has explored in several studies the changes in understanding the history of the earth. These include *Bursting the Limits of Time* which covers the period from 1787-1822 and *Worlds before Adam*, that continues the story until 1845.¹⁶ A subsequent volume *Earth's Deep History* summarises and reinforces the main points in shorter format.¹⁷ A number of themes emerge from Rudwick's publications that are relevant to this study. The first is that members of the clergy were involved in and made important contributions to the debate.

Protestant pastors, Anglican parsons, and Roman Catholic priests were all to be found in some abundance in the ranks of scientific authors; prelates were often as prominent as aristocrats in the lists of subscribers to scientific books, and their names were equally coveted by their savant authors. Whatever reservations they had about specific knowledge claims by particular savants, they would have found ludicrous any suggestion that the learned world was, or ought to be, divided permanently into two warring camps.¹⁸

A second is that much of literature on the history of earth science is Anglocentric and overlooks the contributions made by those writing in languages other than English. Rudwick identifies important contributors to earth history from across Europe, including the German states, Switzerland, Italy and, above all, France. The single largest centre of research and writing in the second half of the eighteenth century was in Paris at the *Jardin du Roi* and its successor after the revolution, the *Muséum d'histoire naturelle*.¹⁹

A third theme identified by Rudwick was the growing recognition that the earth might be of great antiquity.²⁰ 'Deep time' (a term that was not coined until the twentieth

¹⁶ Martin J.S. Rudwick, *Bursting the Limits of Time: the Reconstruction of Geohistory in the Age of Revolution* (Chicago, 2005); Martin J.S. Rudwick, *Worlds before Adam: the Reconstruction of Geohistory in the Age of Reform* (Chicago, 2008).

¹⁷ Martin J.S. Rudwick, *Earth's Deep History: How It Was Discovered and Why It Matters* (Chicago, 2014).

¹⁸ Rudwick, *Bursting the Limits*, pp. 36-37.

¹⁹ Rudwick, *Worlds before Adam*, p. 4.

²⁰ Rudwick, *Bursting the Limits*, pp. 115-131.

century) is frequently attributed to Hutton but the concept was not new.²¹ In his studies of medieval writing on earth history, Ivano del Prete has concluded that 'the narrative of an Enlightenment discovery of geological time, against the "religious prejudices" inherited from the dark ages, is untenable'.²² Dal Prete has shown that Aristotelian teaching on the age of the earth was on the curriculum of medieval universities: 'Medieval philosophers and theologians were both capable and willing to confront the possibility of an ancient world, even one without a temporal beginning'.²³ The idea that the earth was of great age, as suggested by Hutton's *Theory*, might represent an echo of medieval teaching.²⁴

The Terminology of the Natural World

Modern categories such as 'science' 'botany' and 'geology' are of limited use in understanding writing on the natural world before the nineteenth century. While the word 'science' was not new, 'scientist' was only coined in 1834 by William Whewell.²⁵ Dennis Dean has traced the changing meanings of the word 'geology' which was in use from 1731 but did not attain its present meaning until the end of the century.²⁶ It was Jean-André Deluc, a contemporary and critic of Hutton, who was the first to use the term in its modern use.²⁷ 'Botany' has a longer pedigree, dating from 1647, and Carl Linnaeus adopted the term for his *Philosophia Botanica* (1751) introducing and explaining the binomial classification of plants.²⁸

More widespread in the eighteenth century were 'natural history' and 'natural philosophy' to describe the investigation of nature. The difference between the two is not always clear but a reasonable distinction is that natural history proceeded by observation and natural philosophy by deduction.

²¹ John McPhee, *Basin and Range* (New York, 1981); Stephen Baxter, *Ages in Chaos: James Hutton and the Discovery of Deep Time* (London, 2006).

²² Ivano Dal Prete, *On the Edge of Eternity: the Antiquity of the Earth in Medieval and Early Modern Europe* (Oxford, 2022), p. 37.

²³ Dal Prete, *On the Edge of Eternity*, p. 36.

²⁴ Dal Prete, *On the Edge of Eternity*, chap. 6 'The Invention of the History of Deep Time', pp. 157-181.

²⁵ Entry for 'Scientist', OED, accessed 12 May 2024.

²⁶ Dennis R. Dean, 'The word Geology', *Annals of Science*, vol. 36 (1979) pp. 35-43.

²⁷ Martin J.S. Rudwick, *Jean-André de Luc and Nature's Chronology* (London, 2001), pp. 51-60.

²⁸ Carl Linnaeus, *Philosophia Botanica*, trans. Stephen Freer (Oxford, 2003).



Figure 1: James Hutton and Joseph Black portrayed as ‘philosophers’ by John Kay.

Hutton was an Edinburgh polymath, agricultural improver and natural philosopher; Black was Lecturer in Chemistry, Glasgow University (1756-66) and subsequently Professor of Chemistry at Edinburgh (1766-1799).

Ann Blair has described natural philosophy as a ‘discipline dedicated to laying out the principles and causes of natural phenomena’.²⁹ Its origins stretch back to classical antiquity, to Aristotle, and the term continued in use until replaced by new ‘scientific’ terminology in the nineteenth century. Edward Grant has also suggested that through much of its history there was an interaction between natural philosophy and theology.³⁰

In Scotland, as elsewhere, the study of natural philosophy was strongly influenced by Isaac Newton.³¹ The *Principia Mathematica* had first appeared in Latin in 1687 and was translated into English by Andrew Motte (1696-1734) as *The Mathematical Principles of Natural Philosophy* in 1729.³² Feingold has examined Newton’s impact and its wide ranging impact on scientific and enlightenment culture.³³ Paul Wood

²⁹ Ann Blair, ‘Natural Philosophy’, in Katherine Park and Lorraine Daston (eds.), *The Cambridge History of Science*, vol. 3: *Early Modern Science* (Cambridge, 2006), pp. 365-405.

³⁰ Edward Grant, *A History of Natural Philosophy from the Ancient World to the Nineteenth Century* (Cambridge, 2007), especially chapter 9 ‘The Relations between Natural Philosophy and Theology’, pp. 239-273.

³¹ Eri Schliesser, *Newton and Newtonianism in Eighteenth-Century British Thought* (Oxford, 2013).

³² Isaac Newton, *Philosophiæ Naturalis Principia Mathematica* (London, 1687); *The Mathematical Principles of Natural Philosophy*, trans. Andrew Motte (London 1729).

³³ Mordechai Feingold, *The Newtonian Moment: Isaac Newton and the Making of Modern Culture* (Oxford, 2004).

explored Newton's impact in Scotland through the work of Colin Maclaurin (1698-1746), theologian and mathematician, who was a professor first in Aberdeen and then in Edinburgh.³⁴ Maclaurin published an *Account of Sir Isaac Newton's Philosophical Discoveries*, and taught Newtonian theory.³⁵ He was also a consultant to two Church of Scotland ministers, Webster and Wallace, helping them develop the ministers' widows' pension fund. He provided calculations to ensure the solvency of the fund by developing 'life tables', one of the earliest examples of accurate actuarial calculations.³⁶ Others, including Leonidas Montes and David Wilson, have suggested that Scottish universities played a leading role in promoting Newtonian natural philosophy.³⁷ Montes, and others, have argued that Newton's influence is apparent in Adam Smith's *The Wealth of Nations*.³⁸ These studies point to the vitality of Scottish universities in the eighteenth century as centres of the study of natural philosophy. The impact of this vitality on students preparing for the ministry is discussed in chapter eight below.

Natural History

The term 'natural history' had a broader meaning and significance than it does today. Phillip Sloan has described how the study of natural history was associated with the development of learned societies and new methods of inquiry and classification, in particular with Carl Linnaeus (1707-1778).³⁹ Observation and classification of species were not new and Edwin Rose has examined systems of classification before Linnaeus, for example that of John Ray.⁴⁰ However Rose noted the importance of Linnaean classification and how it was adopted by botanists more quickly than zoologists. Linnaeus' classification for plant and animal species was accessible both

³⁴ Paul Wood, 'Science in the Scottish Enlightenment', in Alexander Broadie and Craig Smith (eds.), *The Cambridge Companion to the Scottish Enlightenment* (Cambridge, 2019), pp. 11-36.

³⁵ Olivier Bruneau, 'Colin Maclaurin (1698-1746): a Newtonian between theory and practice', *British Journal for the History of Mathematics*, vol. 35 (2020), pp. 52-62.

³⁶ Judith Grabiner, 'Maclaurin and Newton: the Newtonian style and the authority of mathematics', in Charles Withers and Paul Wood (eds.), *Science and Medicine in the Scottish Enlightenment* (East Linton, 2002), pp. 143-171.

³⁷ Leonidas Montes, 'Newton's real influence on Adam Smith and its context', *Cambridge Journal of Economics*, vol. 34 (2008), pp. 555-576; David B. Wilson, *Seeking Nature's Logic: Natural Philosophy in the Scottish Enlightenment* (University Park, Pennsylvania, 2009).

³⁸ Norriss S. Hetherington, 'Isaac Newton's Influence on Adam Smith's Natural Laws in Economics', *Journal of the History of Ideas*, vol. 44 (1983), pp. 497-505.

³⁹ Phillip R Sloan, 'Natural History, 1670-1802', in R.C. Olby, G.N. Cantor, J.R.R. Christie and M.J.S. Hodge (eds.), *Companion to the History of Modern Science* (London, 1990), pp. 295-313.

⁴⁰ Edwin Rose, *Reading the World: British Practices of Natural History, 1760-1820* (Pittsburgh, 2025), pp. 20-25.

to professionals and amateurs. Using the Linnaean system observers and collectors of flowers, birds, or even rocks, could describe and classify them using a common taxonomy. This method was relatively easy to understand (unlike Newtonian physics) and equally applicable whether adopted by a minister on a walk around the parish or on international expeditions.⁴¹

Gordon Reid has argued that the Linnaean methodology of exploring, gathering, describing and classifying natural phenomena encouraged a hierarchical organisation of knowledge.⁴² Reid suggested that a wide range of later sciences were influenced by his methodology including anthropology, biogeography, ecology, epidemiology, microbiology and palaeontology.⁴³ The impact of Linnaeus on colonial expeditions was of great significance, encouraging pupils such as Daniel Solander to travel further afield to carry out surveys.⁴⁴ Solander, along with English naturalist Joseph Banks accompanied James Cook on the voyage of the Endeavour to the South Pacific from 1768 to 1771. Such voyages were impressive feats of navigation and botanical exploration but had human and colonial impacts that have subsequently been subject to critical scrutiny. Richard Grove, for example, suggested that the international development of natural history became a form of ‘green imperialism’.⁴⁵ Similarly, recent reflections from Scandinavia on the legacy of Linnaeus have explored his legacy and suggested a relationship to colonialism and racism.⁴⁶ Natural history may have started as an empirical investigation of God’s creation but in its links to colonial and commercial development it had human and environmental implications of global significance.

Linnaeus is important in understanding the context in which Scottish ministers were learning about the natural environment. Writing about his impact in Scotland, Charles Withers has described Linnaeus as an example of enlightenment thinking

⁴¹ Wilfred Blunt, *The Compleat Naturalist: A Life of Linnaeus* (London, 1971).

⁴² G.M. Reid, ‘Carolus Linnaeus (1707–1778): his life, philosophy and science and its relationship to modern biology and medicine’ *Taxon*, vol. 58 (2009), pp. 18–31

⁴³ Reid, ‘Carolus Linnaeus’, p. 18.

⁴⁴ Roy A. Rauschenberg, ‘Daniel Carl Solander, the Naturalist on the Endeavour Voyage’, *Isis*, vol. 58 (1967), pp. 367–374.

⁴⁵ Richard H. Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (Cambridge, 1996).

⁴⁶ Annika Windahl Pontén, ‘Summary and reflections on the Linnaeus debate in Sweden 2020/2021’ *Nordic Journal for Eighteenth-Century Studies*, vol. 18 (2021), pp. 139–143.

who sought ‘to represent, to classify and to order the world’.⁴⁷ John Hope, Regius Professor of Botany at Edinburgh University and Keeper of the Royal Botanic Garden Edinburgh from 1760 until 1786, was important in promoting the early adoption of Linnaean system by botanists in Scotland.⁴⁸ John Walker, when a minister at Moffat, was a correspondent of Linnaeus, and followed a Linnaean methodology in his description of plants in his journey to the Western Isles.⁴⁹ Walker was sent by the Commissioners of the Annexed Estates to explore and report back on the natural resources of and how they might be exploited to promote economic development.⁵⁰ In 1779 Walker went on to be Professor of Natural History in Edinburgh where he taught a range of subjects including botany and geology. He was also Moderator of the General Assembly of the Church of Scotland in 1790. An account of his lectures on geology makes clear his enthusiasm for the Linnaean method of collecting and describing botanical specimens and his disdain for ‘speculative’ theories.⁵¹ Linnaeus also developed a classification of minerals that was less widely adopted. Other systems for classifying minerals existed, including one devised by Walker.⁵² Inspired by Walker, one of his pupils, James Smith, went on to establish the Linnaean Society in London in 1788.⁵³ As a leading clergyman and Professor, Walker was an inspiration to ministers and theology students who attended his lectures, as discussed in more detail below.

Others have suggested that the impact of Linnaeus went beyond natural history. Hasselgren has explored his influence in the work of Adam Smith and specifically on *The Wealth of Nations*.⁵⁴ It has already been noted above that Newton may have influenced Adam Smith, suggesting the complexity and interconnectedness of different elements of enlightenment learning. A further and more unusual example of

⁴⁷ Charles Withers, ‘Geography, Natural History and the Eighteenth-Century Enlightenment: Putting the World in Place’, *History Workshop Journal*, no. 39 (1995), pp. 136-163, quotation at p. 138.

⁴⁸ H. J. Noltie, *John Hope (1725-1786): Alan G. Morton's Memoir of a Scottish Botanist* (Edinburgh, 2011), p. 52.

⁴⁹ W.M. Smallwood, ‘Extracts from Two Unpublished Letters of Linnaeus’, *The Scientific Monthly*, vol. 49 (1939), pp. 65-70.

⁵⁰ Margaret M. McKay, *The Reverend Dr. John Walker's Report on the Hebrides of 1764 and 1771* (Edinburgh, 1980).

⁵¹ *Lectures on Geology by John Walker*, ed. Harold W. Scott (Chicago, 1966).

⁵² Matthew D. Eddy, *The language of mineralogy: John Walker, chemistry and the Edinburgh Medical School, 1750-1800* (Farnham, 2008), appendices 4 and 5, pp. 214-217.

⁵³ Withers, ‘Geography and the Enlightenment’, p. 141.

⁵⁴ Björn Hasselgren, *The Scottish Enlightenment and Natural History: An Introduction to Adam Smith's The Wealth of Nations* (Stockholm, 2020).

the influence of natural history is David Hume's *Natural History of Religion*.⁵⁵ First published in 1757, the *Natural History* is divided into twelve sections describing the origins of religion in polytheism and offering comparisons between faiths. Sceptical and descriptive, Hume's approach reflects the style and approach of much writing in natural history.

The scope and range of writing on natural history across Europe was extensive and nowhere more so than in France. The *Encyclopédie* included over 4,500 articles on natural history, over half of which were on botany, with contributions by Daubenton, Diderot, Jaucourt and d'Holbach.⁵⁶ It was from France that another leading naturalist and writer emerged, Georges Leclerc, Comte Buffon, whose dates correspond exactly to those of Linnaeus (1707-1788), and whose writing on natural history and earth history are of significance for the development of natural history in Scotland.

Buffon and the Jardin du Roi

Linnaeus was not universally applauded nor was he the only source of inspiration for the development of natural history in Scotland. Jason Roberts has explored the relationship between Linnaeus and Buffon, suggesting that Buffon was at least as important in his own lifetime.⁵⁷ Paul Wood has examined the influence of Buffon in Scotland arguing that the *Histoire Naturelle* 'was perhaps the most widely read scientific work of the eighteenth century'.⁵⁸ Made an honorary member of the RSE at its foundation, the reasons for Buffon's success and his influence have been explored by Jacques Roger.⁵⁹ Roger suggests that Buffon's diplomatic skills, his access to the court at Versailles and his accessible style of writing contributed to his success. Buffon was *Intendant* (Director) of the *Jardin du Roi* in Paris from 1739 to 1788 during which time it became a leading centre of research into natural history

The *Histoire Naturelle* was published in thirty six volumes from 1749 until Buffon's death in 1788, with further volumes appearing posthumously. The *Histoire* (or extracts from it) were translated into English on several occasions with an edition

⁵⁵ David Hume, 'The Natural History of Religion', in *Four Dissertations* (London, 1757).

⁵⁶ James Llana, 'Natural history and the Encyclopédie', *Journal of the History of Biology*, vol. 33 (2000), pp. 1-25.

⁵⁷ Jason Roberts, *Every Living Thing: The Great and Deadly Race to Know All Life* (New York, 2024).

⁵⁸ Paul. B. Wood, 'The Natural History of Man in the Scottish Enlightenment', *History of Science*, vol. 28 (1990), pp. 89-123.

⁵⁹ Jacques Roger, *Buffon: Un philosophe au Jardin du Roi*, (Paris, 1989).

published in Edinburgh by William Smellie between 1780 and 1785.⁶⁰ An insight into the importance of Buffon's influence in Scotland can be found in the borrowing records of lending libraries in Scotland. The Books and Borrowing Database, an analysis of Scottish borrowers' registers from 1750 to 1830, records that books by Buffon were borrowed more than 900 times during this period, from libraries around Scotland. This number is greater than the total number of books written by Thomas Pennant, Carl Linnaeus and James Hutton combined, that were borrowed during the same period.⁶¹ Buffon's work was popular beyond the circles of the literati in the cities, for example at a lending library in the village of Innerpefferay in Perthshire, where an English translation of Buffon was one of the books most frequently borrowed from the library.⁶² Paul Wood has discussed the impact of Buffon on readers in Aberdeen and the debate it provoked on the Linnaean system of classification (which was opposed by both Buffon and Smellie).⁶³

Buffon is of importance in understanding the response to Hutton's *Theory*. One volume of the *Histoire Naturelle*, the *Époques De La Nature* first published in 1778, seven years before Hutton's *Theory*, set out an alternative explanation of the earth's history.⁶⁴ This is summarised in figure 2 below. Buffon argued that the earth originated as a hot molten mass that cooled slowly over millennia, with the surface slowly solidifying into a crust. In the *Époques* Buffon suggested that the process had so far taken 75,000 years but in private he suggested that the process may have taken far longer. Buffon was censured by the College de Sorbonne for these claims, but without any apparent consequences.⁶⁵ It is known that Hutton studied in Paris from 1747-1749 where he attended lectures by Guillaume-Francois Rouelle and Gregory Todd has argued that Hutton was influenced by French scientific thought.⁶⁶ Hutton

⁶⁰ Jeff Loveland, 'Georges-Louis Leclerc de Buffon's *Histoire Naturelle* in English, 1775–1815', *Archives of Natural History*, vol. 31 (2005), pp. 214–35.

⁶¹ The Books and Borrowing database can be searched at: <https://borrowing.stir.ac.uk/>. For comparison, books by Thomas Pennant were borrowed 239 times, those by Linnaeus 136 times and those by James Hutton only twice.

⁶² Paul Kaufman, 'A Unique Record of a People's Reading', *Libri*, vol. 14 (1964), pp. 227–242.

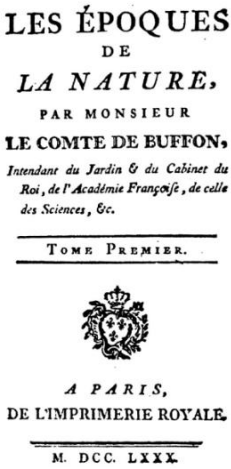
⁶³ Paul B. Wood, 'Buffon's reception in Scotland: the Aberdeen connection', *Annals of Science*, vol. 44 (1987), pp. 169–190.

⁶⁴ Georges Leclerc, Comte Buffon, *Époques De La Nature* (Paris, 1778).

⁶⁵ Roger, *Buffon*, pp. 533–558.

⁶⁶ Gregory Todd, 'The French foundations of Hutton's *Theory of the Earth*, part one: Hutton as a student of Guillaume-François Rouelle', *Earth Sciences History*, vol. 40 (2021), pp. 1–38.

refers to Buffon only in passing but like other natural historians will have been aware of his work.

	Chapter	Dates before present	Description
	I	75,000-72,600	The earth and planets took shape
	II	72,600-40,000	Rocks were formed and the surface cooled into a crust
	III	40,000-25,000	Water covered the continents
	IV	25,000-15,000	The waters receded and volcanic activity commenced
	V	15,000-10,000	Elephants and other animals of the south found in northern lands
	VI	10,000-5,000	The separation of the continents
	VII	5,000-present	The power of man assisted that of nature
Figure 2: Cover page and contents of <i>Les Époques de la Nature</i>			

In conclusion, this brief survey of natural philosophy and natural history has pointed to the richness and excitement that studies of the natural world offered to ministers and others interested in natural history in the years before the statistical accounts were written. Ministers with an interest in natural history would have been aware of the work of Buffon and Linnaeus and were quite possibly also familiar with the debates they engendered on the classification of species or earth history. It is also important in providing the context in which Hutton's *Theory of the Earth* was published.

James Hutton and the *Theory of the Earth*

This section examines literature on Hutton, his *Theory of the Earth*, and the reaction it provoked. As noted above Hutton was not the first to propose a theory of the earth or to suggest that the earth was of very great age. Natural history and natural philosophy were offering new knowledge about the natural world and the age of the earth. By the time of Hutton's *Theory*, Rudwick has argued, there was widespread understanding that the earth was not eternal but that it was far older than human history⁶⁷. The

⁶⁷ Rudwick, *Bursting the Limits*, pp. 130-131.

growth of interest in earth history in Britain has been described by Roy Porter, who suggested it was stimulated in part by the founding of the Royal Society in 1660 and by the impact of Isaac Newton's explanation of the celestial system.⁶⁸ There were important contributions at the end of the seventeenth century including that of Thomas Burnet (1635? -1715) whose *Telluris Theoria Sacra* (*The Sacred Theory of the Earth*) was published first in Latin and then in English between 1681 and 1690.⁶⁹ Later derided by Victorian geologists, including Charles Lyell, for mixing theology and science, Burnet's theory is described by Porter as a melting point of ideas that stimulated many others to join the debate. Hutton's *Theory* differs from Burnet's and Buffon's in several ways. While Buffon and Burnet sought to explain the origins of the earth, Hutton argued that there was no reasonable way of estimating the age of the earth. Rather, his *Theory* sought to explain the duration and stability of the habitable world. An introduction to the Theory is contained in Hutton's abstract of the lectures presented to the RSE in 1785.⁷⁰ Table 1 highlights some of the main points contained in the abstract.

⁶⁸ Roy Porter, *The Making of Geology: Earth Science in Britain 1660-1815* (Cambridge, 1977).

⁶⁹ Stephen Jay Gould, *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time* (Harvard, 1987), pp. 21-59; Thomas Burnet, *The Sacred Theory of The Earth* (London, 1681-1690).

⁷⁰ James Hutton, *Abstract of a dissertation read in the Royal Society of Edinburgh* (Edinburgh, 1785).

Table 1: Highlights from Hutton's *Abstract*

Purpose
The purpose of the dissertation is to form some estimate how long the Earth has existed, the changes which the earth has undergone, and how long it will last. (p. 3)
Method
'From principles of natural philosophy, we may understand the system in the economy of the globe, the course of nature, or to events which are in time to happen'. (p. 4) 'It is only by employing science in this manner, that philosophy enlightens man with the knowledge of that wisdom or design which is to be found in nature.' (pp. 22-23)
The process
Land is a production of the sea, formed by two processes. First, loose and incoherent materials are consolidated on the seabed, and then are elevated 'from the bottom of the sea, the place where they were collected, to the stations in which they now remain above the level of the ocean'. (p. 7). At the same time land is eroded. 'This decay is the gradual ablation of our soil, by the floods of rain; and the attrition of the shores, by the agitation of the waves.' (p. 26)
The mechanism
Heat and fusion cause the consolidation and uplift of loose materials collected at the bottom of the sea. 'The same power of extreme heat, by which every different mineral substance had been brought into a melted state, might be capable of producing an expansive force, sufficient for elevating the land, from the bottom of the ocean, to the place it now occupies above the surface of the sea.' (p. 16)
The timescale
It is not possible to estimate the age of the earth as there are no 'proper means for measuring the waste of land upon the globe, so cannot estimate the duration of what we see at present, nor calculate the period at which it had begun; so that, with respect to human observation, this world has neither a beginning nor an end.' (p. 28)

Rather than a theory, Hutton refers to his dissertation as a 'system' that creates stability revealing the 'wisdom or design' found in nature. As land is eroded by rain and sea, so new land is created, ensuring continuity. This new land is formed by the consolidation and uplift of material on the seabed, a process driven by great heat within the earth, and which, over an immense period of time, is endlessly repeated. This contrasts with the 'standard model' of earth history described by Rudwick, sometimes called 'diluvial' or 'Neptunian', in which the surface of the earth and its rocks were gradually revealed by a receding ocean and in which water, rather than heat, was the principal agent shaping landforms.⁷¹ This is discussed in more detail in chapter seven. Hutton, like most other participants in the debate on the history of the

⁷¹ Rudwick, *Bursting the Limits*, pp. 172-174.

earth, did not commit to dating the age of the earth. The *Theory* implies that the earth must be of immense age, but Hutton argued that there was no reasonable way of determining this, so we cannot know whether there was a beginning. Likewise, the processes shaping the earth's landforms will continue, implying that there is no prospect of an end.

The story of the *Theory*, its presentation to the RSE in 1785 and publication in the Transactions of the RSE (1788) were covered by Dennis Dean in an article published in 1973.⁷² He noted that the 1788 publication of the lectures 'describes the world as a well-designed machine intended by its Creator as a proper habitation for man'.⁷³ Hutton planned a four volume explanation of his system including examples from his field trips and detailed replies to his critics. Two volumes were published in 1795, but the remaining two had not been completed before Hutton's death in 1797.

The Response to Hutton

In his anthology of Scottish Enlightenment writing, Alexander Broadie suggests that Hutton's language suggests a reverence for religion.⁷⁴ Hutton was aware of the theological implications of the *Theory* and drafted a preface to address these concerns. Dennis Dean has discussed correspondence between Hutton and William Robertson, Principal of Edinburgh University about the preface, noting Robertson's advice not to include any such preface. Hutton took Robertson's advice, and the preface was not published.⁷⁵ Robertson's judgment was sound and, there is no evidence in the literature of any theological response to Hutton from the Church of Scotland or its ministers in the years immediately after publication. The Acts of the General Assemblies of the Church of Scotland between 1780 and 1800 contain no reference to Hutton or the *Theory*, nor is there any reference in the informal record of assembly debates contained in the Scots Magazine.⁷⁶ In the statistical accounts

⁷² Dennis R. Dean, 'James Hutton and his public, 1785–1802', *Annals of Science*, vol. 130 (1973), pp. 89–105.

⁷³ Dean, 'James Hutton and his public', p. 91.

⁷⁴ Alexander Broadie (ed.), *The Scottish enlightenment: An Anthology* (Edinburgh, 1997), pp. 771–780.

⁷⁵ Hutton's proposed preface can be found in Dennis R. Dean, 'James Hutton on Religion and Geology: the unpublished preface to his Theory of the Earth (1788)', *Annals of Science*, vol. 32 (1975), pp. 187–193.

⁷⁶ The Acts of the General Assembly of the Church of Scotland 1638–1842 are available at British History online <https://www.british-history.ac.uk/church-scotland-records/acts/1638-1842/pp843-847#h3-s4>; *The Scots Magazine* from 1739–1803 is available at the British Newspaper Archive: <https://www.britishnewspaperarchive.co.uk/>.

there are critical references to theories of the earth but no explicit criticism of Hutton. This is discussed in more detail in chapter six. There were, however, responses from mineralogists and other writers interested in earth history.

Hutton's Critics: Williams, Deluc and Kirwan

If the clergy in Scotland were almost entirely silent, there were responses from others in the years from the publication to Hutton's death in 1797. The *Theory* was reviewed in at least three periodicals, the *Monthly Review*, *Analytical Review* and *Critical Review*⁷⁷. Dean notes that the reviews were respectful even if the *Critical Review* complained that 'The mind cannot comprehend so vast a system'⁷⁸ One of the most vociferous early critics was John Williams, a Welsh mining engineer working in the coal industry in Scotland who in 1789 published a *Natural History of the Mineral Kingdom*.⁷⁹ In a lengthy preface he attacked both Buffon and Hutton. Drawing on his experience of examining coal seams underground he argued, quite reasonably, that heat was not necessary to explain the consolidation of loose material into rock. The weight of accumulated material was sufficient to compress and consolidate loose materials into rock strata.⁸⁰ Williams went on to make a theological criticism: 'our modern philosophers labour hard to confirm their favourite scepticism, by all possible means; or, in other words, they labour hard to rob us of our best inheritance, both here and hereafter, to sap the foundations of our belief in revelation.'⁸¹ Published in 1789, Williams also referred to revolutionary developments in France, expressing his fear of disorder and 'rebellion against lawful authority, which must soon end in anarchy, confusion, and misery'.⁸² Theory and disorder appear connected in his mind.

The most detailed response to Hutton came from Jean-André Deluc, FRS, in letters published in the *Monthly Review* in 1791. Dean comments that: 'Covering more than seventy pages, they constitute the lengthiest and perhaps most influential discussion

⁷⁷ Dean, 'James Hutton and his public', p. 92.

⁷⁸ Dean, 'James Hutton and his public', p. 93.

⁷⁹ John Williams, *The Natural History of the Mineral Kingdom* (Edinburgh, 1789). There is a discussion of Williams' pessimistic view of coal reserves in Frederik Albritton Jonsson, *Enlightenment's Frontier: the Scottish Highlands and the Origins of Environmentalism* (New Haven, 2013), chapter 7.

⁸⁰ Williams, *Natural History*, pp. xxxiii-xxxvii.

⁸¹ Williams, *Natural History*, pp. lxi.

⁸² Williams, *Natural History*, pp. lx.

of Hutton's theory before Playfair'.⁸³ Martin Rudwick has identified Deluc as one of the foremost writers on earth history and meteorology. Deluc was the first person to use the term 'geology' in its modern sense and combined theory with extensive fieldwork for example on the formation of ephemeral features in the landscape, such as river deltas and scree slopes.⁸⁴ Dean suggested it was Deluc's contribution that encouraged Hutton to develop a fuller explanation of the *Theory* in a projected four volume study.

Hutton's most trenchant critic was Richard Kirwan (1733-1812), who wrote a series of critical papers culminating in a seventy page article in 1797.⁸⁵ Kirwan FRS, FRSE, was a distinguished natural philosopher with expertise in chemistry and meteorology, who was President of the Royal Irish Academy from 1799.⁸⁶ Ray Perman has described the debate between Hutton and Kirwan.⁸⁷ Perman notes that most of Kirwan's objections to Hutton were on technical aspects of the *Theory* but Kirwan went on to criticise theories of the earth, including those of Buffon and Hutton, as inconsistent with the Mosaic account of creation and the flood.⁸⁸ Subsequently Kirwan has been held up as an example of the religious reaction to Hutton.⁸⁹ While this may be true, it is important to note that neither Kirwan nor Williams were theologians or church ministers. In the years following its publication, criticism of Hutton's *Theory* did not come from the Church of Scotland or its ministers but from others working in mineralogy and related subjects.

One external factor noted in the response of Williams is also important. As described above, the study of natural history was largely empirical, involving description, some experimentation and classification. A general distrust of theory was reinforced by revolution in France. Jack Morrell coined the term 'theophobia gallica' to describe the impact of the French Revolution on scientific debate in Scotland. He described how some in the scientific community in Scotland recoiled from anything that could be

⁸³ Dean, 'James Hutton and his public', p. 95.

⁸⁴ Rudwick, *Bursting the Limits*, pp. 150-157.

⁸⁵ Richard Kirwan, 'On the Primitive State of the Globe and Its Subsequent Catastrophe', *Transactions of the Royal Irish Academy*, vol. 6 (1797), pp. 233-308.

⁸⁶ Entry for 'Richard Kirwan' in *Dictionary of Irish Biography*, <https://www.dib.ie/>.

⁸⁷ Ray Perman, *James Hutton*, chapter 19, pp. 186-194.

⁸⁸ Richard Kirwan, 'On the Primitive State of the Globe', pp. 265-269.

⁸⁹ Rudwick, *Bursting the Limits*, p. 336.

considered revolutionary.⁹⁰ An example was John Robison (1739-1805), Professor of Natural Philosophy at Edinburgh who published an antijacobin tract *Proofs of a conspiracy against all the religions and governments of Europe*.⁹¹ This included a denunciation of Joseph Priestley and descriptions of Voltaire, Rousseau, D'Alembert and Diderot as fomenters of revolution and atheism.⁹² John Playfair, Professor of Mathematics at Edinburgh from 1785 and Robison's successor as Professor of Natural Philosophy later dismissed Robison's concerns as nonsense but this atmosphere of 'theophobia' appears to have been important in shaping some of the responses to Hutton.

Hutton's reputation was revived after his death by John Playfair in his *Illustrations of the Huttonian Theory of the Earth* published in 1802.⁹³ The tercentenary of Hutton's birth in 2026 has stimulated renewed interest with biographies by Alan McKirdy and Ray Perman published in 2022.⁹⁴

The silence of the Church and its ministers around Hutton's *Theory* at its publication remains a puzzle. Give the importance of the *Theory*, a general distaste for theoretical speculation, and the apparently radical content of the *Theory* why was there so little response visible from the Church or its ministers? The detailed descriptions of Church of Scotland ministers in the statistical accounts offer a mass of evidence against which to examine this question.

⁹⁰ Jack B. Morrell, 'Professors Robison and Playfair, and the Theophobia Gallica: Natural philosophy, religion and politics in Edinburgh, 1789-1815' *Notes and records of the Royal Society of London*, vol. 26, (1971), pp 43-63. Etymologically 'theophobia' means a fear or loathing of God but here it refers to a dislike of theory.

⁹¹ John Robison, *Proofs of a Conspiracy against All the Religions and Governments of Europe* (Edinburgh, 1797).

⁹² Morrell, 'Professors Robison and Playfair' p. 50.

⁹³ John Playfair, *Illustrations of the Huttonian Theory of the Earth* (Edinburgh, 1802).

⁹⁴ The principal biographies of Hutton include E.B. Bailey, *James Hutton: The founder of modern geology* (London, 1967); S. Baxter, *Revolutions in the earth: James Hutton and the true age of the world* (London, 2003); S. Baxter, *Ages in chaos: James Hutton and the discovery of deep time* (New York, 2004); Dennis R. Dean, *James Hutton and the history of geology* (Ithaca, 1992); W.H. Galbraith, 'James Hutton: An analytic and historical study', PhD thesis, University of Pittsburgh (1974); J. Jones, *James Hutton: Founder of modern geology* (Edinburgh, 1984); Alan McKirdy, *James Hutton: The Founder of Modern Geology* (Edinburgh, 2022); Ray Perman, *James Hutton: The Genius of Time* (Edinburgh, 2022); John Playfair, *Biographical account of James Hutton* (Cambridge, 2011); J. Repcheck, *The Man who Found Time: James Hutton and the discovery of the Earth's antiquity* (London, 2003).

Enlightenment and Religion in Scotland

This section introduces the literature on the Scottish Enlightenment, setting this in the wider European context. It goes on to examine how studies of the Scottish Enlightenment deal with religion and the environment. Literature on the Scottish Enlightenment initially focussed on the literati of the cities but has developed to include a much broader range of subjects. This includes the development of science, the impact on communities around Scotland and the ‘practical’ enlightenment of agricultural improvement. The literature shows that Church of Scotland ministers were active in all these activities.

Published in 1965, Peter Gay entitled the first part of his account of the European Enlightenment *The Rise of Modern Paganism*, stressing the antagonism of enlightenment ‘philosophes’ to Christianity.⁹⁵ For Gay, the *philosophes* of the European Enlightenment sought to free themselves from their Christian heritage and to move from myth to reason. At the zenith of this process was the figure of David Hume who Gay called ‘the complete modern pagan’.⁹⁶ Setting aside this view of Hume’s religious belief, which is itself contested, the narrative set out by Gay has since been challenged and largely revised⁹⁷. Jonathon Sheehan, writing in 2003, noted ‘in the past ten years, religion has returned to the Enlightenment.’⁹⁸ In part this has been brought about by studies of the Enlightenment in its national context, which have explored how religion played a part in shaping enlightenment thinking in countries across Europe.

A volume of essays on *The Scientific Revolution in National Context* pointed to the involvement of churches and the clergy in the Enlightenment across Europe.⁹⁹ Samuel Taylor identified a ‘liberal Protestantism’ that gained ascendancy in Geneva and Joachim Whaley and T.C.W Blanning noted a similar engagement of the clergy in German states, in both protestant and catholic cities. The editors, Roy Porter and

⁹⁵ Peter Gay, *The Enlightenment: An Interpretation*, vol. 1: *The Rise of Modern Paganism* (New York, 1966).

⁹⁶ Gay, *Enlightenment*, vol. 1, p. 401.

⁹⁷ In a detailed study of David Hume’s *Dialogues concerning Natural Religion* David O Connor concludes that Hume was ‘an evidentialist, sceptical, ironic deist’; see David O Connor, *Routledge Philosophy Guidebook to Hume on Religion* (London, 2001), p. 14.

⁹⁸ Jonathan Sheehan, ‘Enlightenment, Religion, and the Enigma of Secularization’, *American Historical Review*, vol. 108 (2003), pp. 1061-1080, quotation at p. 1062.

⁹⁹ Roy Porter and Mikuláš Teich (eds.), *The Scientific Revolution in National Context* (Cambridge, 1992).

Mikuláš Teich, concluded that it is important ‘to grasp the many different forms the Enlightenment took in vastly different social and political environments’, not least in its engagement with religion.¹⁰⁰ A recent study of the Nordic countries reinforces this conclusion by showing how the Lutheran church helped shape aspects of the Enlightenment in Denmark, Finland, Norway and Sweden.¹⁰¹ The Enlightenment was not exclusively linked to protestant churches. Lehner has argued that there was a similar movement in the catholic church ‘an apologetic endeavour designed to defend the essential dogmas of Catholic Christianity by explaining their rationality in modern terminology and by reconciling Catholicism with modern culture.’¹⁰²

The ‘Scottish Enlightenment’ was a term first used by Scott in 1900 in a biography of Francis Hutcheson (1694-1746), Professor of Moral Philosophy at Glasgow University but its academic study is a more recent phenomenon.¹⁰³ Colin Kidd linked the growth in interest in the Scottish Enlightenment to a stimulating intervention by Hugh Trevor Roper in 1967 who suggested that the Scottish Enlightenment had religious origins.¹⁰⁴ Initially, much of the early literature was on philosophers and their writings.¹⁰⁵ For example, an anthology of writing about the Scottish Enlightenment included a selection of writings on human nature, ethics, aesthetics and religion from authors including David Hume, Dugald Stewart, Thomas Reid, Adam Smith and Hugh Blair.¹⁰⁶ It went on to include writing on economics, politics, law, and language but only in the final chapter did it include science. The writings are primarily from authors whom Sher has described as the ‘*literati*’, the majority of whom were associated with Edinburgh.¹⁰⁷ Of the research that has emerged in the decades since Trevor Roper, Sher’s study of the *literati* of Church and University in Edinburgh confirmed the

¹⁰⁰ Porter and Teich, *The Scientific Revolution in National Context*, p. vii.

¹⁰¹ Johannes Ljungberg and Erik Sidenvall, ‘Reason and orthodoxy in the Nordic countries: an introduction’ in *Religious Enlightenment in the Eighteenth-Century Nordic Countries* (Lund, 2023).

¹⁰² U.L. Lehner, ‘What is Catholic Enlightenment?’, *History Compass*, vol. 8 (2010), pp. 166-178, (quotation at p. 166); U.L. Lehner, *The Catholic Enlightenment: The Forgotten History of a Global Movement* (Oxford, 2016).

¹⁰³ William Robert Scott, *Francis Hutcheson: his life, teaching and position in the history of philosophy* (Cambridge, 1900), p. 257.

¹⁰⁴ Colin Kidd, ‘Lord Dacre and the Politics of the Scottish Enlightenment’, *Scottish Historical Review*, vol. 84 (2005), pp. 202-220.

¹⁰⁵ Paul Wood, ‘Defining the Scottish Enlightenment: Richard B. Sher, Church and University in the Scottish Enlightenment: The Moderate Literati of Edinburgh’, *Journal of Scottish Philosophy*, vol. 15 (2017), pp. 299-311.

¹⁰⁶ Broadie, (ed.) *The Scottish Enlightenment: an Anthology*.

¹⁰⁷ James Buchan, *Capital of the Mind: How Edinburgh Changed the World* (Edinburgh, 2007).

importance of religion to the Scottish Enlightenment.¹⁰⁸ Sher described the development of the community of *literati* following the 1745 rebellion, a community led by ministers associated with the moderate party in the Church of Scotland who were intellectually liberal but politically conservative, and who helped create a milieu in which enlightenment ideas could flourish.

This 'moderate' Enlightenment stands in contrast to the antagonism suggested by Gay or the radical Enlightenment associated with Spinoza described by Jonathan Israel.¹⁰⁹ Rather than a radical development, Israel has described the Scottish Enlightenment as liberal, Calvinist and Newtonian and attempt to rationalise the existing political regime.¹¹⁰ The Scottish Enlightenment was embraced by church and state even if its leading philosopher, David Hume, was openly sceptical about religion. Sher suggested that the values of the *literati* included a love of learning, reason and science, a dedication to humanism and a preference for order and stability.¹¹¹ The Edinburgh clergymen who were leading *literati* included Hugh Blair (1718-1800), Professor of Belles Lettres in Edinburgh University and minister of Edinburgh's High Kirk; William Robertson (1721-1793), principal of Edinburgh University; Alexander Carlyle (1722-1805), minister at Inveresk (Musselburgh); John Home (1722-1808), formerly minister at Athelstaneford and playwright; and Adam Ferguson (1723-1816), military chaplain and professor of Moral Philosophy in Edinburgh.

Similar studies of Glasgow and Aberdeen have reinforced the idea of a moderate enlightenment associated with the clergy and universities.¹¹² Other studies have suggested the moderate clergy did not have a monopoly of enlightenment thinking.¹¹³ A formidable opponent of the moderate party was John Witherspoon (1723-1794) who, while critical of moderate leadership of the Church, nevertheless embraced

¹⁰⁸ Richard B. Sher, *Church and University in the Scottish Enlightenment: The Moderate Literati of Edinburgh*, Edinburgh University Press (Edinburgh, 1985).

¹⁰⁹ Jonathan I. Israel, *Spinoza: Life and legacy* (Oxford, 2023).

¹¹⁰ Israel, Jonathan I Israel, *Democratic Enlightenment: Philosophy, Revolution, and Human Rights 1750-1790* (Oxford, 2011), especially chapter 9 'Scottish Enlightenment and Man's Progress', pp. 233-269.

¹¹¹ Sher, *Church and University*, p. 8.

¹¹² Andrew Hook and Richard B. Sher (eds.), *The Glasgow Enlightenment* (Edinburgh, 2001); Paul B. Wood, *The Aberdeen Enlightenment: the Arts Curriculum in the Eighteenth Century* (Aberdeen, 1993).

¹¹³ John R. McIntosh, *Church and Theology in Enlightenment Scotland: The Popular Party, 1740-1800* (Edinburgh, 2001).

satire as effectively as moderate ministers such as Alexander Carlyle.¹¹⁴ His style was matched by a commitment to learning and to moral philosophy, which became apparent in his subsequent career as principal of New Jersey College in British North America. In New Jersey, Witherspoon was an opponent of British Government policies towards the American colonies, a signatory of the Declaration of Independence and a supporter of the revolutionary war. Witherspoon was, perhaps, closer to Israel's idea of a radical enlightenment than most of his moderate opponents.

Science in the Scottish Enlightenment

In a collection of essays on *Science and Medicine in the Scottish Enlightenment*, the editors, Charles Withers and Paul Wood suggested that: 'The study of the history of science and medicine in eighteenth century Scotland came of age in the 1970s'.¹¹⁵ Interest grew quickly and, in 2003, Paul Wood argued that science was 'a pivotal component of the intellectual culture of the Scottish Enlightenment'.¹¹⁶ In a study of Glasgow University David Wilson described how a community of natural philosophers were developing new theories and experimental work in physics, mathematics and chemistry.¹¹⁷ The community in Glasgow University included William Cullen (1710-1790), lecturer in chemistry from 1747 to 1751, his successor Joseph Black (1728-1799), lecturer in chemistry from 1756-1766, John Anderson (1726-1796) Professor of Natural Philosophy from 1757 to 1796, and John Robison (1739-1805), Professor of Chemistry from 1766 to 1770. Wilson noted that there was no evidence of hostility towards religion among this group, rather the reverse. Anderson was professor of Professor of Natural Philosophy from 1757 to 1796 and the author of an unpublished theological treatise in 1770, setting out his belief that 'design is a surer proof of God's existence than revelation'.¹¹⁸ For Aberdeen, Wood's study of the arts curriculum in King's College and Marischal College demonstrated that both natural history and

¹¹⁴ John Witherspoon, *Ecclesiastical Characteristics: or the Arcana of Church Policy* (Edinburgh, 1753); Kevin DeYoung, *The Religious Formation of John Witherspoon: Calvinism, Evangelicalism, and the Scottish Enlightenment* (London, 2020).

¹¹⁵ Charles W.J. Withers and Paul Wood (eds.), *Science and Medicine in the Scottish Enlightenment* (East Linton, 2002), p. 1.

¹¹⁶ Paul Wood, 'Science in the Scottish Enlightenment', *The Cambridge Companion to the Scottish Enlightenment* (Cambridge, 2003): pp. 90-112, quotation at p.91.

¹¹⁷ David B. Wilson, *Seeking Nature's Logic: Natural Philosophy in the Scottish Enlightenment* (University Park, 2009).

¹¹⁸ Wilson, *Seeking Nature's Logic*, p. 176.

natural philosophy were taught as part of the curriculum.¹¹⁹ As aspiring ministers studied the arts curriculum before going on to study divinity, this is important in understanding ministers' interest in the natural environment and is discussed in more detail in chapter three below.

The Local Enlightenment

If much of the literature has focussed on elite communities in university cities, other studies show that enlightenment ideas spread more widely across Scotland. Bob Harris and Charles McKean explored the Scottish Enlightenment in small towns including Selkirk, Irvine, Dunfermline, Kirkcudbright and Perth.¹²⁰ The study showed that the idea of 'improvement' was reflected in the growth of towns across the country and was associated with a vibrant cultural life. The authors have compiled examples of new clubs, societies, circulating and subscription libraries, schools, theatres, concerts, assembly halls, free masons' lodges, newspapers and periodicals to illustrate these developments.¹²¹

Ministers played an important role in the changes taking place in small towns, sometimes opposing developments such as new theatres but elsewhere supporting development such as the spread of inoculation. Whether ministers were effective as agents of enlightenment or obstacles to improvement could depend on a range of local circumstances.¹²² A study of inoculation by Deborah Brunton examined the responses of congregations to inoculation and how this varied from acceptance to outright rejection.¹²³ This is considered in more detail in chapter three below.

The Enlightenment and the Environment:

In a study of the highlands Frederik Albritton Jonsson observed that 'Historians of enlightenment have traditionally ignored the natural environment.'¹²⁴ Richard Oram has made the same argument in his account of the Little Ice Age in Scotland.¹²⁵ One

¹¹⁹ Paul B. Wood, *The Aberdeen Enlightenment*, pp. 15, 67, 105-106.

¹²⁰ Bob Harris and Charles McKean, *The Scottish Town in the Age of the Enlightenment 1740-1820* (Edinburgh, 2014).

¹²¹ See tables in Harris and McKean, *The Scottish Town*, pp. 403-412.

¹²² Harris and McKean, *The Scottish Town*, pp. 375-376.

¹²³ Deborah Brunton, 'Smallpox inoculation and demographic trends in eighteenth-century Scotland', *Medical History*, vol. 6 (1992), pp. 403-429.

¹²⁴ Frederik Albritton Jonsson, *Enlightenment's Frontier: the Scottish Highlands and the Origins of Environmentalism* (New Haven, 2013), p. 1.

¹²⁵ Richard D. Oram, *Where men no more may reap or sow: the Little Ice Age: Scotland 1400-1850* (Edinburgh, 2024, especially chapter 1, Introduction).

aim of this thesis is to help fill the gap by sharing many examples of descriptions of the natural environment written by ministers in the statistical accounts. There have been many descriptions of agriculture, one of the main activities shaping the Scottish environment. Tom Devine, for example, has described how from 1760 to 1820 the landscape and economy of lowland Scotland were transformed by a process known to participants as ‘improvement’.¹²⁶ Commercial agriculture developed rapidly during these years. Landowners made substantial investments in farming infrastructure including enclosure of open fields with walls, ditches and hedges, new farm buildings and lime kilns, all with a view to improve their estates and to increase rental income. There are some studies linking agriculture and enlightenment, but the relationship is not always recognised in the literature of the Scottish enlightenment.¹²⁷ Broadie’s anthology, for example, does not include a chapter on the place of agriculture in the Scottish Enlightenment. Ministers were exposed to developments in both agriculture and enlightenment, as graduates of Scottish Enlightenment universities and as ministers in farming parishes across Scotland. Christopher Smout has described the agricultural interests of several ministers in a review of recent literature on ‘improvement’.¹²⁸ One ministers who played an important role was Adam Dickson (1721–1776), minister at Duns in Berwickshire and then at Whittinghame in East Lothian. Dickson’s *Treatise of Agriculture* was published in several editions between 1762 to 1825 and was one of the most widely read guides to agricultural improvement.¹²⁹

Other examples of ministers promoting agricultural improvement are found in the county surveys commissioned by the Board of Agriculture (chaired by Sir John Sinclair) and published from 1793 to 1817, with at least six of the surveys authored by ministers. They appeared in parallel with the statistical accounts but, unlike the

¹²⁶ T. M. Devine, *The Transformation of Rural Scotland: Social Change and the Agrarian Economy 1660-1815* (Edinburgh, 1994).

¹²⁷ Examples of studies linking enlightenment and agriculture include Nigel Leask, *Robert Burns and Pastoral: Poetry and Improvement in Late Eighteenth-Century Scotland* (Oxford, 2010); Hugh Cheape, ‘For the Betterment of Mankind: Scotland, the Enlightenment and the Agricultural Revolution’, *Folk Life*, vol. 40 (2001), pp. 7–24; and, for the European context, Peter M. Jones, *Agricultural enlightenment: knowledge, technology, and nature, 1750-1840* (Oxford, 2016).

¹²⁸ T. C. Smout, ‘A new look at the Scottish Improvers’ *Scottish Historical Review*, vol. 91 (2012), pp. 125-149. A list of Scottish agricultural writers, including ministers, can be found in Heather Holmes, ‘Scottish Agricultural Writers and the Creation of their Personal Identities between 1697 and 1790,’ *Folk Life*, vol. 44 (2005), pp. 87-109.

¹²⁹ Adam Dickson, *A Treatise of Agriculture* (Edinburgh, 1765).

statistical accounts, covered all the counties of Britain and Ireland.¹³⁰ Ministers from both the moderate and popular factions in the Church were involved in farming. William Leechman (1706–1785) who was Principal and Professor of Divinity at Glasgow University and a leading moderate was also a farmer at Auchinairn near Bishopbriggs.¹³¹ William Thom (1710-1790) minister at Govan, was hostile to the moderate clergy, but shared Leechman’s interest in farming and was the author of *Seasonable Advice to the Landholders and Farmers in Scotland*.¹³² Some of the leading *literati* of Edinburgh also maintained agricultural interests. Henry Home, Lord Kames, (1696-1782), was an Edinburgh advocate, judge and historian and author of *The Gentleman Farmer* in 1776.¹³³ In retirement he took on the transformation of the estate he inherited at Blair Drummond near Stirling, draining the waterlogged carse to create new farmland. James Hutton (1726-1797) was a farmer at Slighouses in the Berwickshire parish of Bunkle and Preston in the decade before 1768 and wrote an extensive treatise on agriculture.¹³⁴ David Hume (1711-1776) was brought up at Ninewells in the parish of Chirnside where his elder brother John was an active improver.¹³⁵ The connections between agriculture and enlightenment in Scotland are deeply rooted and ministers were important in both worlds. In most rural parishes ministers wrote more about farming in the OSA than almost any other subject, often referring to progress of improvement. They were both observers and participants in improvement, educated at enlightenment universities and bringing that learning to bear in their observations on agriculture.

The Highlands

Agricultural improvement was at its most effective in the south and east of Scotland where better soil and a more favourable climate allowed landowners and tenants to apply new techniques with success. In the north and west, where conditions were far

¹³⁰ Surveys written by ministers include *Angus* by James Roger, (1767–1849), minister at Dunino; *Dunbartonshire*, *Kinross and Roxburghshire* both by David Ure (1749-1798) formerly assistant minister at East Kilbride and later minister at Uphall; *Dumfriesshire* by Bryce Johnston (1747-1805) minister at Holywood, Dumfriesshire; and *Galloway* by Samuel Smith (died 1816) minister at Borgue.

¹³¹ Entry for ‘William Leechman’ in ODNB.

¹³² William Thom, *Seasonable Advice to the Landholders and Farmers in Scotland* (Edinburgh, 1770).

¹³³ Henry Home, Lord Kames, *The Gentleman farmer, being an attempt to improve agriculture by subjecting it to the test of rational principles* (Edinburgh, 1776).

¹³⁴ The MS of James Hutton’s ‘Elements of Agriculture’ is held at the National Library of Scotland, reference MSS.23165-23166. It is currently being edited for publication by Alan Werritty.

¹³⁵ Chirnside, County of Berwick, OSA, vol. XIV, 1795, p. 11.

less favourable, good soil was patchy, the climate cool and damp, and improvement was more challenging. Cultural and linguistic barriers also created a perception that the highlands were different. Adam Smith regarded the highlands as a feudal society in need of government intervention to lift it into the modern commercial world.¹³⁶ Jonsson explored lowland attitudes towards the highlands which he described as a ‘laboratory’ in which a range of approaches and experiments linked to improvement were attempted.¹³⁷ He noted the quasi colonial nature of the highlands, the range of travellers visiting the highlands and the accounts they wrote. Ministers were participants in these developments, for example as hosts to visiting travellers such as Thomas Pennant.¹³⁸ The role of ministers in the exploration of the highlands is discussed in more detail in chapter four below.

Clergy Naturalists

There are no systematic studies of ‘minister naturalists’ in Scotland but there are examples of studies elsewhere. Patrick Armstrong compiled a list of ‘parson naturalists’, principally in England and Wales, who were active across a range of subjects including botany, ornithology, entomology, and geology.¹³⁹ An early example was William Turner, Dean of Wells and ‘the father of English botany’ who published a herbal in 1551 describing 300 plants, their properties, habitats and medicinal uses.¹⁴⁰ Among the most famous was Gilbert White of Selborne, author of *The Natural History of Selborne*, but Armstrong identified others who made important contributions to earth sciences. These include John Josiah Conybeare (1779-1824) and William Buckland (1784-1856) at Oxford, and Adam Sedgwick (1785-1873) and William Whewell (1794-1866) at Cambridge. Of the 55 founder members of the Geological Society in London in 1807, eight were clergymen.¹⁴¹

¹³⁶ Dimitrios Ioannis Halikias, ‘Adam Smith on the Scottish Highlands and the Origins of Commercial Society’, *History of Political Thought*, vol. 41 (2020), pp. 622-647.

¹³⁷ Jonsson, *Enlightenment's Frontier*, p. 1.

¹³⁸ Thomas Pennant, *A Tour of Scotland and Voyage to the Hebrides 1772* (Edinburgh, 1998).

¹³⁹ Patrick Armstrong, *The English Parson-Naturalist: a Companionship Between Science and Religion* (Leominster, 2000).

¹⁴⁰ Armstrong, *The English Parson-Naturalist*, pp. 43-45.

¹⁴¹ A database of clerical naturalists from across Britain and Ireland is being compiled by Brycchan Carey, see <https://www.brycchancarey.com/naturalists/index.htm>. ‘Minister naturalists’ identified in this study have been added to the database.

Clergy naturalists were not just a British phenomenon. In France, a study by Eric Baratay discusses the contribution of clergy naturalists to zoology from the late seventeenth century onwards.¹⁴² Among the leading clergy naturalists were Noël-Antoine Pluche (1688-1761), author of *Le Spectacle de la nature* first published in 1732, and Jean-Antoine Nollet (1700-1770), Director of the *Académie Royale des Sciences*.¹⁴³ Others contributors listed by Baratay included Abbé Ray, and Abbé Bourassé (1813-1872) who was professor of Theology and Zoology at Tours.¹⁴⁴ Baratay discussed the motivation of the clergy in studying the natural world:

It is not a question of pure scientific curiosity and even less of a love of animals, but rather of rediscovering great Christian truths. If not all Cartesians, the clerics still share values common to scholars of this time in considering the world and creatures as marvellous mechanisms created by a watchmaker God. elevating them and providing proof of His existence, His power, His wisdom.¹⁴⁵

There is no comparable survey of ‘minister naturalists’ in Scotland but the examination of the statistical accounts in this thesis offers the opportunity to help fill this gap, as discussed in chapter eight below.

Conclusion to Chapter Two

It was noted above that Jonsson believed that most historians of the Enlightenment have ignored the environment, but a comment by Richard Whatmore in 2023 suggests that this understanding may need revision:

The general and accepted meaning of the Enlightenment today is that it was a great leap forward in the capacity of humans to control nature, generate wealth and direct their own destinies.¹⁴⁶

While studies of the Scottish Enlightenment have broadened in scope, attitudes towards the environment are still imperfectly understood. One of the aims of this study is to help fill the gap by identifying what Church of Scotland ministers were writing about the natural environment in the OSA and to what extent this reflects Whatmore’s judgement.

¹⁴² Eric Baratay, ‘Zoologie et Eglise Catholique dans la France du XVIIIe Siècle (1670-1840): Une Science au Service de Dieu’, *Revue d'Histoire des Sciences*, vol. 48 (1995), pp. 241-265.

¹⁴³ Noël-Antoine Pluche, *Le Spectacle de la Nature*, 7 vols (Paris, 1732-1742); also published in English translation as *Spectacle de la Nature: or, Nature Displayed* (London, 1733).

¹⁴⁴ Abbe Ray, *Zoologie Universelle et Portative* (Paris, 1788); Jean-Jacques Bourassé, *Histoire Naturelle des oiseaux, des reptiles et des poisons* (Tours, 1840).

¹⁴⁵ Baratay, ‘Zoologie et Eglise Catholique’, p. 253.

¹⁴⁶ Richard Whatmore, *The End of Enlightenment: Empire, Commerce, Crisis* (London, 2023), p. 1.

This review has brought together a selection of studies to help understand the context to the OSA. The studies have described the development of natural history and natural philosophy in universities and elsewhere. The methods of natural history; observation, description and classification, offered ministers the opportunity to explore their parish and to describe, identify and classify the fauna, flora, minerals, fossils and other features of the local environment. The next chapter examines how Church of Scotland ministers engaged in these developments, both in their education and through other contemporary scientific developments.

Chapter Three: Church of Scotland Ministers' Education and Engagement with Science

This chapter examines in more detail ministers' attitudes towards science. It starts by showing how ministers' interest was stimulated by their education in Scottish universities and how their commitment to science was demonstrated by their support for inoculation against smallpox. It goes on to examine the role of leading ministers in the early years of the Royal Society of Edinburgh (RSE).

The Education of Ministers in Scottish Universities

The overwhelming majority of ministers contributing to the OSA had been educated in Scottish universities. The study of natural philosophy and natural history were part of the arts curriculum which students were required to follow before progressing to study for the ministry. This chapter explores the role of education in shaping ministers' interest in the natural environment.

In previous chapter it was noted that historians of science had rejected the conflict model of the relationship between science and religion and, instead, accepted that there was a far more complex relationship between the two, a relationship that had helped rather than hindered the development of scientific thinking. It was also noted that that there was an important aesthetic element to the study of the natural world. In Scottish universities there were several professors, some closely associated with the Church of Scotland, who taught this approach. An early example was Francis Hutcheson, Professor of Moral Philosophy at Glasgow, who published an *Inquiry into the Original of Our Ideas of Beauty and Virtue* in 1725. Hutcheson based his study of aesthetics on the model of natural philosophy.¹ He argued that science and art were satisfying and aesthetically pleasing in much the same way that the beauties of nature were pleasing and that God had arranged our experience of the natural world to give us aesthetic pleasure and encourage human curiosity.² Emily Brady has explored the

¹ Thomas P. Miller 'Frances Hutcheson and the Civic Humanist Tradition', in Andrew Hook and Richard B. Sher (eds.) *The Glasgow Enlightenment* (Edinburgh, 2021), pp. 40-55.

² Alexander Wragge-Morley, *Aesthetic Science: Representing Nature in the Royal Society of London, 1650–1720* (Chicago, 2020), p. 12.

relationship between aesthetics and science noting that Hutcheson and other philosophers writing about beauty and other aesthetic categories were also interested in human nature and Newtonian science.³

Thomas Reid (1710-1796) followed Hutcheson in this tradition. He was a Church of Scotland minister at New Machar from 1737 until he was appointed Regent at Aberdeen in 1752, and then finally Professor of Moral Philosophy at Glasgow in 1764. While he is better known for 'Common Sense' philosophy, his initial interest was in natural history, an interest he maintained throughout his career. At Kings College Aberdeen he lectured on Natural History from 1753 covering subjects as diverse as animal anatomy, plant physiology, and schemes of classification, including those of Ray, Linnaeus and others.⁴ He was actively involved in field work, botanising in the country around Aberdeen with George Skene, Professor of Natural Philosophy at Marischal College in Aberdeen. Reid was also involved in agricultural improvement. Both in New Machar and in Aberdeen he was a close friend of Archibald Grant of Monymusk, a landowner who was a leader in agricultural improvement in the northeast. Reid took a practical interest in improvement at his glebe at New Machar and was also a member of Gordon's Mill Farming Club, an Aberdeenshire agricultural society.⁵ Like Hutcheson, Reid believed the study of nature revealed the beauty of God's creation.⁶

Reid's diverse interests in natural history, natural philosophy and agricultural improvement were not unusual. The arts curriculum at Scottish universities in this period suggested other professors shared this wide range of interests and further evidence for this comes from the OSA itself. An unusual feature of the OSA is the inclusion of accounts from three universities: Glasgow, and Marischal and King's College in Aberdeen. There were no separate accounts for Edinburgh or St Andrews universities.⁷ The account from Glasgow was 'transmitted' by Professor George Jardine

³ Emily Brady, 'Hutcheson and Reid on Natural Beauty', *Journal of Scottish Thought*, vol. 7 (2016), pp.29-51.

⁴ Paul Wood (ed.), *Thomas Reid on the Animate Creation: Papers Relating to the Life Sciences* (Edinburgh, 1995), pp. 3-4.

⁵ Wood, *Thomas Reid on the Animate Creation*, p. 56.

⁶ Brady, 'Hutcheson and Reid on Natural Beauty', pp. 15-23.

⁷ Sinclair apologised for the absence of separate accounts for the Universities of Edinburgh and St Andrews: OSA, vol. XXI, 1799, pp. v-vi.

on behalf of the Principal and Professors but, according to the Fasti, was the work of Thomas Reid.⁸ In the account he introduced the curriculum:

What is called the curriculum, or ordinary course of public education, comprehends at present five branches, the Latin and Greek languages, logic, moral philosophy, and natural philosophy. These branches are understood to require the study of five separate sessions.⁹

He further explained that: ‘before they enter the class of natural philosophy, the students are expected to acquire a knowledge of mathematics and algebra’. There was also a professor of practical astronomy, ‘whose business is to make observations, for the improvement of that great branch of physics’.¹⁰

He also noted that Sir William Hunter had donated his anatomical and natural history collections to the university and that:

The progress of botany and natural history, and the wonderful discoveries in chemistry, have now extended the sphere of these useful branches beyond the mere purposes of the physician, and have rendered a competent knowledge of them highly interesting to every man of liberal education.¹¹

Reid’s assertion that the discoveries of science were of interest to ‘every man of liberal education’, not just the specialist is significant. He suggested that in the arts degree there were opportunities for all students, whether aspiring ministers, lawyers or doctors, to learn about the scientific exploration of the natural world.

David Wilson has argued that between 1740 and 1760, Glasgow was the most important centre for the study of natural philosophy in Scotland.¹² A leading group of natural philosophers taught in Glasgow University, including William Cullen, Joseph Black ‘the preeminent Scientist in the Scottish Enlightenment’ and John Anderson.¹³ Anderson was professor of Natural Philosophy from 1754 to 1796 and in his *Institutes of Physics* set out reasons for studying natural philosophy:

⁸ Fasti, vol VI, pp. 66-67.

⁹ University of Glasgow, OSA, vol. XXI, 1799, pp. 29-30.

¹⁰ University of Glasgow, p. 30.

¹¹ University of Glasgow, pp. 40-41.

¹² David B. Wilson, *Seeking Nature's Logic: Natural Philosophy in the Scottish Enlightenment* (University Park, Pennsylvania, 2009).

¹³ Wilson, *Seeking Nature's Logic*, p 133.

The inducements to pursue this branch of philosophy; from curiosity, from the love of beauty, truth, and grandeur; from the advantages it brings to human life, by the improvement of arts, machines, and manufactures; and from manifold proofs it gives of wisdom, power, and goodness in the creation.¹⁴

Anderson prepared an unpublished theological treatise in 1770 in which he argued that belief in God was an essential part of human nature, and that design is a surer proof of God's existence than revelation.¹⁵ His classes included lectures on natural history, including mineralogy, in which he joined the general criticism of theory noted in chapter seven above. While not mentioning Hutton or Buffon by name he wrote: 'so many Fancies, unsupported by Facts have been called by the name of Cosmogenies'.¹⁶ Anderson taught mathematics and Newtonian physics, but he too joined the chorus of scepticism about theories of the earth.

Some examples of the education of ministers are provided in a study of Scottish universities by Jack C. Whytock.¹⁷ While Whytock's study is primarily concerned with the theological education of ministers it refers to the high standard of general education expected of candidates for the ministry. Presbyteries had to be satisfied that candidates were adequately prepared, and they considered a university arts degree an ideal foundation, even if it was not mandatory.¹⁸ The General Assembly also took an active role in ensuring candidates were properly educated, for example in 1782 passing an Act to uphold educational standards.¹⁹

Evidence from the Fasti suggests that almost all ministers who contributed to the OSA held the degree of M.A. There are some autobiographical accounts that illustrate the variety of classes that they attended, including those in natural philosophy or natural history. One example is by Thomas Somerville (1741-1830), minister at Jedburgh and author of the statistical account for the parish.²⁰ He had attended school at Duns where he was taught by the minister, Adam Dickson, also the author of one of the leading

¹⁴ John Anderson, *Institutes of Physics* (Glasgow, 1777), p. 15.

¹⁵ Wilson, *Seeking Nature's Logic*, p. 176.

¹⁶ Wilson, *Seeking Nature's Logic*, p. 196.

¹⁷ Jack C. Whytock, *An Educated Clergy: Scottish Theological Education and Training in the Kirk and Secession, 1560-1850* (Milton Keynes, 2008).

¹⁸ Whytock, *An Educated Clergy*, p. 101.

¹⁹ Whytock, *An Educated Clergy*, p. 100.

²⁰ Thomas Somerville, *My Own Life and Times, 1741-1814* (Edinburgh, 1861).

agricultural textbooks published in Scotland.²¹ Somerville attended Edinburgh University (1756-1759) where he studied Greek, Latin, mathematics and logic. In his third year he took classes in natural and moral philosophy.²² Natural philosophy was taught by John Stewart, Professor of Natural Philosophy, and Matthew Stewart, Professor of Mathematics, whose teaching Somerville found wearisome, but he praised Alexander Monro, Professor of Anatomy:

His style was fluent, elegant, and perspicuous, and his pronunciation perhaps more correct than that of any public speaker in Scotland at this time. I heard his concluding lecture at the end of the session 1757; and I think I had never before been as much captivated with the power and beauty of eloquent discourse. The purpose of his address was to impress on his students the moral and religious improvement of the science of Anatomy, as it displayed evidence of the wisdom, power, and infinite goodness of the Creator.²³

Somerville found the study of anatomy, 'improving' and revealing of God's 'wisdom, power and goodness'. Closely associated with the Edinburgh literati described by Richard Sher, Somerville was also interested in agricultural experimentation and later attempted to grow tobacco at the manse at Jedburgh.²⁴

Another source of information on student life and the curriculum is the autobiography of Alexander Carlyle (1722-1805), minister at Inveresk and Moderator of the General Assembly in 1770.²⁵ He initially attended Edinburgh University where his first-year studies included mathematics under Colin Maclaurin, whom he found: 'the clearest and most agreeable lecturer on that abstract science that ever I heard'.²⁶ He also studied Latin, logic and French. In 1737 he attended Robert Stewart's natural philosophy class, 'which was very ill taught, as he was worn out with age'.²⁷ The following year he also attended a class by Maclaurin: 'who, on account of the advanced age and incapacity of Sir Robert Stewart, not only taught Astronomy, but gave us a

²¹ Adam Dickson's *A Treatise on Agriculture* was first published in 1762, with a second edition in 1765 and a third in 1766; see H. Holmes, 'Scottish Agricultural Writers and the Creation of their Personal Identities between 1697 and 1790', *Folk Life*, vol. 44 (2005), pp. 87-109.

²² Somerville, *Life*, p. 10.

²³ Somerville, *Life*, p. 22.

²⁴ Somerville, *Life*, p. 202.

²⁵ Alexander Carlyle, *Autobiography of the Rev. Dr. Alexander Carlyle, Minister of Inveresk: Containing Memorials of the Men and Events of His Time* (Edinburgh, 1861).

²⁶ Carlyle, *Autobiography*, p. 32.

²⁷ Carlyle, *Autobiography*, p. 46.

course of experiments in Mechanics, with many excellent lectures in Natural Philosophy, which fully compensated the defects of the other class'.²⁸

On 13 January 1739, with Maclaurin and other 'senior scholars' Carlyle observed a total eclipse of the moon. He went on to study theology in Glasgow with William Leechman where he attended Francis Hutcheson's class 'with great satisfaction and improvement'.²⁹ In Glasgow he also enjoyed the acquaintance of Robert Simson, Professor of Mathematics, Robert Dick, Professor of Natural Philosophy, and William Cullen, lecturer in chemistry.³⁰ These examples show how arts students intending for the ministry, or other professions, had access to classes and teachers in natural sciences.

A further useful source of information on the curriculum is the Commission of Inquiry into Scottish Universities that visited Scottish universities to gather evidence in 1837.³¹ At Marischal College, Aberdeen, the commissioners were informed that, since 1781, M.A. students had been required to attend regularly for four years, and to have studied Greek, Civil and Natural History, Mathematics, Natural Philosophy, Moral Philosophy and Logic as part of the curriculum, as set out in the table below.³²

²⁸ Carlyle, *Autobiography*, p. 50.

²⁹ Carlyle, *Autobiography*, p. 70.

³⁰ Carlyle, *Autobiography*, p. 99.

³¹ *Report of the Commissioners for visiting the universities of King's College and Marischal College, Aberdeen* (London, 1838), p. 200. The impact of this and subsequent commissions of inquiry on university education in Scotland form the subject of George Davie's study, *The Democratic Intellect: Scotland and her Universities in the Nineteenth Century* (Edinburgh, 1961).

³² *Report of the Commissioners*, p.199

Table 2: Arts Curriculum in Marischal College

Year of study	Subjects studied (hours per week)
One	Greek (15) Latin (6)
Two	Greek (3) Latin (3) Civil and Natural History (15) Mathematics (6)
Three	Mathematics (6) Natural Philosophy (15)
Four	Moral Philosophy and Logic (15)
All years	Practical Religion, once a-week, for 19 weeks, during all the years.

The evidence submitted to the Commissioners points to the inclusion of natural history, natural philosophy and mathematics in the arts curriculum towards the end of the century. Most ministers compiling the OSA would have been educated in Scottish universities at an earlier date than this but the evidence from the autobiographies quoted above suggest that they too had benefitted from education in natural history and natural philosophy.

Natural History and Natural Philosophy in the Aberdeen Arts Curriculum

The most detailed study of the university education of aspiring ministers and others in the arts curriculum is by Paul Wood.³³ Wood describes how the arts curriculum changed and developed through the century at the two Aberdeen universities, King's College and Marischal College, and how the study of natural history and natural philosophy came to occupy a prominent place in the curriculum. As in Edinburgh, he explains that the Aberdeen enlightenment was predominantly clerical and professorial in leadership, including notable figures such as James Beattie, William Maclaurin as well as Thomas Reid. All three were involved in the promotion of natural history and natural philosophy in the Aberdeen universities.

An early development was the proposal in 1726 to change the curriculum to put in place: 'a compleat course of experimental philosophy in the Marischal College of Aberdeen'³⁴ The proposal came from the Principal and Masters of the College, who

³³ Paul B. Wood, *The Aberdeen Enlightenment: The Arts Curriculum in the Eighteenth Century* (Aberdeen, 1993).

³⁴ Wood, *Aberdeen Enlightenment*, p.15.

were also seeking funds to buy instruments for the study of 'Astronomy, Mechanicks, Opticks, Chymistry, Hydrostaticks, and Anatomy'. The proposal also sought funds for new books on natural and experimental philosophy and 'models of the newest Machines in Husbandry'.³⁵

As noted above, in King's College, Thomas Reid was active in strengthening the place of natural philosophy, introducing mathematics for arts students, and developing plans in 1754 for a museum, chemistry laboratory and dissection room.³⁶ A museum was also established at Marischal College in 1764, with minerals, anatomical specimens and other natural history collections. Later, in 1780, in an apparently short-lived experiment, Robert Memis, an Episcopalian clergyman 'was given £20 to enable him to cultivate about ¼ acre as a botanical garden'.³⁷

A Chair of Civil and Natural History was created at Marischal College in 1753 with Francis Skene as the first professor. Under natural history he lectured on both 'the greater masses' of the heavens, earth, sea and air and 'lesser bodies' (flora and fauna).³⁸ The aim of the study of natural history, according to Skene, was to explain the 'wise and benevolent design evident in the natural order'.³⁹ A similar sentiment was expressed by Thomas Reid at King's College. Reid argued that the study of nature was useful, contributing to useful arts of trade and commerce, but was also important as it led us 'to admire and love that Being who hath furnished this world with such a prodigious variety of things for our use and convenience'.⁴⁰

In both colleges, Wood concludes, the motivation for studying the natural environment was as much spiritual and moral as it was practical. He quotes a student at King's, John Bethune, who went on to be a minister in Canada. Bethune described Sunday mornings in the college in 1787 when, between breakfast and church, students attended lectures in natural history and related subjects: 'to demonstrate the wisdom and goodness of

³⁵ Wood, *Aberdeen Enlightenment*, p. 17.

³⁶ Wood, *Aberdeen Enlightenment*, pp. 67-71.

³⁷ D. J. S. Sutherland, 'The History of The Teaching of Science in Scottish Schools', PhD thesis, University of St Andrews (1938).

³⁸ Wood, *Aberdeen Enlightenment*, p. 91.

³⁹ Wood, *Aberdeen Enlightenment*, p. 93.

⁴⁰ Wood, *Aberdeen Enlightenment*, p. 94.

providence, and other principles of natural religion.’⁴¹ Placing natural history lectures immediately before the church service on a Sunday morning testifies to the importance attached to the study of natural history and its spiritual significance.

Wood notes that in the last quarter of the century the curriculum in the colleges came to include more on the ‘larger masses’ of natural history including the solar system, the earth, heat and meteorology.⁴² James Beattie, Professor of Civil and Natural History at Marischal College from 1788 included meteorology, hydrology, geology, mineralogy, botany, and chemistry in his lectures. Wood suggests the influence of John Walker, Professor of Natural History in Edinburgh, was important in shaping the content of Beattie’s lectures, which included reference to Buffon, Linnaeus and the new chemistry of Lavoisier.⁴³ Robert Eden Scott (1770-1811) was appointed Professor at King’s in 1788, teaching moral philosophy and natural philosophy. His lectures also mentioned Buffon, Linnaeus, and Hutton. Scott was comfortable introducing their works on theories of the earth but would not be drawn into commenting on the age of the earth. Scott wrote in 1795 that it was possible to know something about the revolutions of the globe but that it was beyond our understanding to know about its original creation: ‘we can only hope in this as in other sciences to make progress by a patient investigation of a phenomena’ rather than depending on theory.⁴⁴ Scott was echoing the commonly held scepticism about theory that has been noted above. Inductive reasoning from observation or experimentation was acceptable to Scott, but abstract theorising was much less satisfactory. Wood also noted that Scott, like John Robison in Edinburgh, developed acute ‘theophobia’ in the face of the revolution in France, recoiling from radical politics and revolutionary theories.⁴⁵ Scepticism about abstract theories relating to the natural world were enhanced by fear of radical theories about government emerging from revolutionary France.

In summary, at both Kings and Marischal, the study of the natural world grew in importance as part of the arts curriculum through the century. This leads to several

⁴¹ John Bethune, quoted in Wood, *Aberdeen Enlightenment*, p. 94.

⁴² Wood, *Aberdeen Enlightenment*, p. 95.

⁴³ Wood, *Aberdeen Enlightenment*, p. 99.

⁴⁴ Wood, *Aberdeen Enlightenment*, p. 200.

⁴⁵ Wood, *Aberdeen Enlightenment*, p. 99.

important conclusions. While similar developments have been noted in other Scottish universities Wood's study explains in detail how study of the natural environment was integrated into the arts curriculum. Through lectures, in museum collections, laboratories, an astronomical observatory and a botanical garden, students were exposed to a range of opportunities to learn about the natural environment. The teaching of natural history was encouraged not just out of scientific curiosity but as an expression of natural theology. In common with John Anderson's views noted above the study of nature was of moral and spiritual importance as well as of practical benefit.

The breadth of education of Church of Scotland ministers in Scottish universities is important in helping to understand how ministers responded to Sinclair's request to write an account of their parishes. Personal interest in the natural world was encouraged by the teaching of professors who linked the study of the natural environment to theology. For ministers educated in Scottish universities, understanding of the natural environment was invested with moral and spiritual significance as well as practical utility.

The Clergy as an Audience for Natural History: John Walker's Class Lists

John Walker has already been introduced as a Church of Scotland minister and a professor of natural history, whose teaching was influential for a generation of students, including future ministers. Class lists exist for his lectures in Edinburgh between 1782 and 1800, from which theology students and members of the clergy can be identified. An annotated list of attendees published by Eddy gives the names of students, degree, year of attendance, and sometimes geographic origin or other details.⁴⁶ The list contains 650 names of whom forty-seven can be identified unambiguously as theology students, ministers, preachers or having some other clerical associations (there may be other unidentified members of the clergy in the list). Table 3 summarises the number in each category.

⁴⁶ Matthew D. Eddy, 'The University of Edinburgh natural history class lists 1782–1800', *Archives of Natural History*, vol. 30 (2003), pp. 97–117.

Table 3: Attendees at John Walker's natural history classes 1782–1800

Status	Number
Minister	3
Preacher	25
Theology student	14
Others with a church connection (includes a professor of divinity, a missionary and an episcopal priest)	5
Total	47

The three entries identified as ministers were Thomas MacKnight, minister at South Leith, who attended the lectures in 1797; Rev. McRobert from Shetland in 1782, about whom nothing more is known; and in 1784 John Stuart, minister at Luss. Thomas MacKnight went on to be Moderator of the General Assembly in 1820 and was a fellow of the RSE, whose records list him as a 'minister, mathematician and geologist'.⁴⁷

The list includes fourteen theology students, about whom there are few further details. One was James Walker, later Bishop of Edinburgh (1830–1841) and Primus of the Scottish Episcopal Church (1837–1841). Twenty-five entries were listed as 'preachers', an ambiguous title that might include ministers from secession or other churches, or 'stickit' ministers (ministers without a parish). A few can be identified from other sources including Henry Garnock (1796) who later appeared as minister of Canongate Kirk (1811 to 1820).⁴⁸ John Rogers of Collace later became minister for Collace and the author of the NSA for the parish.⁴⁹ Among the 'others' are Rev. Dr Andrew Hunter (1798) University of Edinburgh Professor of Divinity (1779-1809); Rev. Daniel Sandford (1796) vicar of the Scottish Episcopal Church at Charlotte Chapel in Edinburgh and subsequently Bishop of Edinburgh (1806-1830); and John Playfair (1782) who became Professor of Mathematics in Edinburgh in 1785 and subsequently author of the *Illustration of Huttonian Theory*.

Such a long and varied list points to the widespread appeal of John Walker's teaching of natural history classes among theology students and clergy of different denominations.

⁴⁷ FFRSE, p. 598.

⁴⁸ Fasti, vol I, p24.

⁴⁹ Collace, County of Perth, NSA, vol. X, 1845, pp. 210-218.

Wood's account noted above also suggested Walker was influential in promoting the teaching of natural history in Aberdeen. Ministers, theology students and others attending the lectures shared a common interest in the natural world and its scientific exploration. The attitude of ministers towards science can also be illuminated by their response to inoculation, as described in the next section.

Inoculation

The OSA also throws light on a parallel development in the 1790s: ministers' attitudes toward smallpox inoculation. This is a subject frequently mentioned by ministers with references to inoculation in 253 of the 938 accounts. While not an environmental issue, inoculation throws light on ministers' interest in medical science and their strong views about its importance. Statistics of mortality for Glasgow between 1783 and 1800 show the high number of deaths associated with smallpox, which was responsible for over 19% of all deaths. In 1791 this rose to over 28% of all deaths.⁵⁰ Children were particularly at risk: in Glasgow in 1791 smallpox was responsible for 44% of all deaths of children under the age of ten.⁵¹ The outbreak of 1791 and its dreadful consequences will have been fresh in the minds of some ministers when writing their parish accounts.

There is an extensive literature on the history of inoculation against smallpox that documents its use as a preventative measure for some decades before the OSA.⁵² A study by Bennett describes how the use of inoculation spread widely in mid-century England with publication in 1743 of a guide to inoculation by James Kirkpatrick.⁵³ Bennett notes that clergy were generally supportive of inoculation:

⁵⁰ E. J. Edwardes, *A Concise History of Small-Pox and Vaccination in Europe* (London, 1902). The data is available on line at <https://www.statista.com/statistics/1107629/smallpox-share-total-deaths-glasgow-historical/>.

⁵¹ James Stark, 'Inquiry into the Probable Cause of the Continued Prevalence and Fatality of Small-Pox' *Edinburgh Medical and Surgical Journal*, vol. 64 (1845), pp. 130-156.

⁵² Herve Bazin, *Vaccination: a history from Lady Montagu to genetic engineering* (Esher, 2011), pp. 25-6; Raymond Stearns and George Pasti, 'Remarks upon the introduction of inoculation for smallpox in England', *Bulletin of the History of Medicine*, vol. 24, (1950): pp. 103-122; Gavin Weightman, *The Great Inoculator: The Untold Story of Daniel Sutton and his Medical Revolution* (New Haven, 2020).

⁵³ Michael Bennett, *War Against Smallpox: Edward Jenner and the Global Spread of Vaccination* (Cambridge, 2020), p. 35.

Across Europe, the major Catholic and Protestant churches generally took the position that, if the practice could be recommended as beneficial by medical men, it raised no ethical concerns and could even be regarded as a blessing.⁵⁴

In this context the response of ministers to smallpox found in the OSA is revealing of their attitudes to medical science.

Uptake of Inoculation across Scotland

A study of the use of inoculation in Scotland by Deborah Brunton in 1992 drew on information in the OSA. She identified that there were significant regional variations in the uptake of inoculation and that responses among congregations varied from acceptance to hostility.⁵⁵ The geographical pattern of inoculation across Scotland she identified is set out in table 4.⁵⁶

Table 4: Response to inoculation across Scotland by county

Widely adopted	Less widely adopted	Unpopular
Orkney, Shetland, Sutherland, Caithness, western Ross and Inverness, Argyll, parts of north Perthshire, Dumfries, Kirkcudbright, Wigtown, parts of Berwick and Roxburgh.	Banff, Nairn, eastern Inverness, eastern Ross and Cromarty.	Aberdeen, Kincardine, Angus, south Perthshire, Kinross, Clackmannan, Fife, Ayr, Lanark, Renfrew and Dunbarton.

These data suggest that the highest levels of uptake were among the remoter parishes of the *Gaeltachd* in the western highlands and islands, and in the rural areas of the southwest. The greatest reluctance to accept inoculation was in the counties near Glasgow. Cost was one factor in determining uptake and where inoculation was provided without charge, it was more widely adopted. For example, on the impoverished island of Jura the minister, Francis Stewart, noted how poverty limited

⁵⁴ Bennett, *Smallpox*, p. 61. 'Inoculation' generally referred to transferring the smallpox virus from one patient to another, a riskier procedure than 'vaccination' with a cowpox virus, which was promoted by Edward Jenner in the 1790s. Jenner's experiments were not published until 1798, too late for the authors of the OSA to know of them.

⁵⁵ Deborah Brunton, 'Smallpox Inoculation and Demographic Trends in Eighteenth-Century Scotland', *Medical History*, vol. 36 (1992), pp. 403-429.

⁵⁶ Data drawn from Brunton, 'Smallpox Inoculation', pp. 417-422.

uptake: 'The small-pox, in the natural way, carried off many children in autumn 1791. The people entertain no prejudice against inoculation, but grudge the expense of it.'⁵⁷ On the neighbouring island of Islay there was a more positive story from John McLiesh, minister of Kilchoman:

The small pox, which used to make a vast devastation, is now easily got over by inoculation; one surgeon having, last season, performed that operation upon more than 800 children, very few of whom died. Some people advanced in years were also inoculated, with good effects. The poor were inoculated gratis, and the operator enjoys their blessing.⁵⁸

Although uptake was uneven Brunton demonstrates that ministers who wrote about inoculation in the OSA were, without exception, in favour of it. Ministers sought to encourage members of their congregations to accept inoculation by exhortation or, in a few cases, by direct intervention.

A few ministers were directly involved in inoculating parishioners, including three in the presbytery of Dumfries. One of these was William Wright of Newabbey, who commented on the effectiveness of the programme:

The former virulence and ravages of the small-pox are much abated in this and the neighbouring parish of Kirkgunzion, owing to the ministers performing the operation of inoculation to a considerable extent, and with the greatest success, among their respective parishioners.⁵⁹

He hinted that there was a plan 'now in agitation, for instructing the students of divinity at the University of Edinburgh in the art of inoculation, which the physicians of that city generously and humanely propose to do without putting them to any expence'.⁶⁰ Similar examples of ministers practising inoculation are found in the Dumfriesshire parishes of Kirkgunzeon and Kirkpatrick Irongray, and in Tingwall, Shetland, where the minister William Mitchell went on to suggest that 'students of divinity might easily acquire this branch of the medical art, when attending the different universities'⁶¹

⁵⁷ Jura, County of Argyll, OSA, vol. XII, 1794, p. 320.

⁵⁸ Kilchoman, County of Argyll, OSA, vol. XI, 1794, p. 278.

⁵⁹ New Abbey, County of Kirkcudbright, OSA, vol. II, 1792, p. 126.

⁶⁰ New Abbey, p. 126.

⁶¹ Kirkgunzeon, County of Kirkcudbright, OSA, vol. VII, 1793, p. 187; Kirkpatrick-Irongray, County of Kirkcudbright, OSA, vol. IV, 1792, p. 527; Tingwall, Whiteness and Weesdale, County of Shetland, OSA, vol. XX, 1798, p. 282.

While such direct interventions were unusual, ministers in many parishes noted the positive impact of inoculation. For example Alexander Stewart in Killean and Kilchenzie on Kintyre commented: 'The prejudice against inoculation for the small-pox is now done away; and that disease, formerly so fatal to children, very seldom proves mortal; of 100 children inoculated last year not one died.'⁶² On the Isle of Skye, Malcolm MacLeod in the parish of Snizort suggested that the increase in population in the parish was due to a reduction in deaths from small pox. The disease, he reflected, had previously 'swept away whole families' but since inoculation had been introduced 'seldom proves mortal'.⁶³ Other parishes where ministers reported that inoculation was accepted by congregations included those of William Bethune at Duirinish on Skye, and George Drummond at Mordington in the county of Berwick.'⁶⁴

Many accounts express the frustration of ministers in parishes where inoculation was unpopular. In East Kilbride David Ure wrote that inoculation 'meets here with a bad reception'. He criticised 'rooted prejudices and arguments that were trifling or absurd' and hoped that unreasonable prejudices would decline.⁶⁵ In Cathcart, south of Glasgow, David Dow told a similar story:

The prejudices against inoculation are so deeply rooted, that notwithstanding the long experience of its efficacy, it has as yet made but small progress. This terrible malady often returns, and sweeps away the rising hopes of their families, and yet will not have recourse to such an obvious method of mitigating its severity.⁶⁶

A melancholy report was provided by John Burns for the parish of Barony of Glasgow: 'This season the small-pox has been very frequent among the children, and vast numbers have died. Inoculation is yet far from being generally practised, though the unreasonable prejudices entertained against it are gradually wearing off.'⁶⁷ Other ministers who expressed frustration included Andrew Grant at Portmoak, in Fife, George Gib at Wemyss in Fife, William Logan of Symington near Ayr and William Boyd at Fenwick in Ayrshire. Boyd wrote of deep resistance in the parish: 'The prejudices

⁶² Killean and Kilchenzie, County of Argyll, OSA, vol. XIX, 1797, p. 628.

⁶³ Snizort, County of Inverness, OSA, vol. XVIII, 1796, p. 183.

⁶⁴ Mordington, County of Berwick, OSA, vol. XV, 1795, p. 175.

⁶⁵ East Kilbride, County of Lanark, OSA, vol. III, 1792, p. 427.

⁶⁶ Cathcart, County of Renfrew, OSA, vol. V, 1793, pp. 352-353.

⁶⁷ Barony of Glasgow, County of Lanark, OSA, vol. XII, 1794, p. 110.

against inoculation are great. Some even deem it a sin to give children anything by way of preparation'.⁶⁸ The minister at Banff, Abercromby Gordon, put words into the mouth of the congregation to explain their reluctance: 'We tempt GOD, say they, by voluntarily bringing on a disease which we might possibly have escaped: We throw ourselves in the way of danger; we discuss the Providence of Almighty God, who is all-sufficient to deliver us.'⁶⁹

In the northeast of Scotland at Auldearn, in the county of Nairn, John Paterson similarly expressed his frustration about the beliefs of his congregation.

The people are in general averse to inoculation, from the general gloominess of their faith, which teaches them, that all diseases which afflict the human frame are instances of the Divine interposition, for the punishment of sin; any interference, therefore, on their part, they deem an usurpation of the prerogative of the Almighty.⁷⁰

This purpose of this digression into medical history has been to demonstrate that Church of Scotland ministers supported inoculation as a medical intervention. By implication, therefore, they also accepted a medical view of smallpox. informed by science. They understood that smallpox was a serious, often fatal, disease that could be prevented, or its impact reduced, by inoculation. Their support appears to have been unequivocal across the country and across factions within the Church, although at variance with the views of many in their congregations. While some members of congregations believed that the medical intervention of inoculation was contrary to God's will, ministers profoundly disagreed. Ministers also believed that prejudice against inoculation among congregations needed to be overcome. This suggests that there was a gap in many parishes between the university educated ministers, self-consciously promoting enlightened ideas of inoculation, and their congregations, most of whom had not been educated at universities and many of whom held views that ministers found frustrating and antiquated. In this respect ministers were agents of

⁶⁸ Portmoak, County of Kinross, OSA, vol. V, 1793, p. 159; Wemyss, County of Fife, OSA, Vol. XVI, 1795, p. 514; Symington, County of Ayrshire, OSA, vol. V, 1793, pp. 395-396; and Fenwick, County of Ayrshire, OSA, vol. XIV, 1795, p. 52.

⁶⁹ Banff, County of Banff, OSA, vol. XX, 1798, 348.

⁷⁰ Auldearn, County of Nairn, OSA, vol. XIX, 1797, p. 618.

enlightenment, promoting inoculation as a practical and moral imperative but with mixed success across Scotland.

Church of Scotland Ministers and the Royal Society of Edinburgh

A final example of the involvement of ministers in scientific debate comes from the Royal Society of Edinburgh (RSE). Founded in 1783, the RSE was a learned society that brought together many of Edinburgh's social and political elite as well as scientists, historians, and other scholars from across Scotland and beyond.⁷¹ Its founding members included several leading churchmen. This is significant because in 1785 the RSE was the venue for the first public presentation of James Hutton's *Theory of the Earth*, subsequently published in the first volume of the *Transactions* of the RSE (1788).⁷² In its early years the RSE offered a centre of debate and discussion on the natural sciences, including geology and meteorology, that were emerging from the older studies of natural history and natural philosophy. Members of the clergy who were members of the RSE will have been exposed to these ideas and debates.

Church of Scotland ministers were involved with the RSE in several ways. They are listed in the *Transactions* as founding members, they published papers in the *Transactions* and made donations to the natural history collections of the Society. Among the papers by Church of Scotland ministers published in the first volume of the *Transactions* is one by John Walker, on the motion of sap in trees.⁷³ There was also an account of 'a remarkable agitation' in Loch Tay by Thomas Fleming, minister at Kenmore, and an astronomical paper by Thomas Elliot, minister at Cavers in the county of Roxburgh.⁷⁴ Donations to the Society by ministers included fossils found in Scotland, and specimens brought back from expeditions, among which was a donation from Dr. Bowmaker, Minister of Duns, of 'Two species of serpents from Florida'.⁷⁵

⁷¹ Steven Shapin, 'Property, patronage, and the politics of science: the founding of the Royal Society of Edinburgh', *The British Journal for the History of Science*, vol. 7 (1974), pp. 1-41.

⁷² James Hutton, 'The Theory of the Earth', *Transactions RSE*, vol. I, pp. 209-304.

⁷³ John Walker, 'On the motion of sap in trees', *Transactions RSE*, vol. I, pp. 4-40.

⁷⁴ Thomas Fleming, 'An Account of a Remarkable Agitation of the Waters of Loch Tay', *Transactions RSE*, vol. I, pp. 200-202; Thomas Elliot, 'An Improvement of the Method of correcting the observed Distance of the Moon from the Sun or a Fixed Star', *Transactions RSE*, vol. I, pp. 191-200.

⁷⁵ *Transactions RSE*, vol. I, p. 78.

Ministers in Membership of the RSE

The founding members of the RSE fell into different categories: resident members, non-resident members and foreign members (honorary and ordinary). Resident members were generally those who were resident in or around Edinburgh, and non-resident mainly those from elsewhere in Scotland. Among the small number of foreign members were Benjamin Franklin and George Leclerc, Comte Buffon from the Jardin du Roi in Paris.⁷⁶ As noted in chapter two, Buffon was the author of *Histoire Naturelle*, translated into English and published in Edinburgh by William Smellie.⁷⁷ As shown in table 5, the total number of resident and non-resident members was 166, with fourteen foreign members in addition.

Table 5: Founding members of the RSE by category

Membership of RSE	All Members	Churchmen	%
Resident	96	15	15
Non resident	70	22	31
All resident and non-resident	166	37	22
Foreign	14	0	0

Thirty-seven members (22%) of 166 domestic founding members were churchmen. They included former or current Church of Scotland ministers and Moderators of the General Assembly, professors of theology and also of other subjects at Scottish universities. The details of all churchmen identified as founding members of the RSE are given in the appendix two.⁷⁸ At least five of the ministers who were RSE members also contributed to the OSA: Alexander Carlyle (Inveresk), John Main (Newton), Thomas Robertson (Dalmeny), Robert Small (Dundee), and John Stewart (Luss). Of the non-resident members over 30%, or nearly a third, were churchmen. Non-resident churchmen who were also founding members were distributed around Scotland, particularly in the three university centres of Aberdeen, Glasgow and St. Andrews.

⁷⁶ Jacques Roger, *Buffon: un philosophe au Jardin du Roi* (Paris, 1989).

⁷⁷ Ronald B. Hatch, 'William Smellie: Philosopher of Natural History', *Studies in Scottish Literature*, vol. 12 (2014), pp. 159–180.

⁷⁸ The list of members is drawn from the *Transactions RSE*, vol. I, pp. 83–93, with additional details from FFRSE and ODNB.

Sher views the foundation of the RSE as the swansong of the Church of Scotland's moderate party as a cultural force in Scotland.⁷⁹ He points to the decline of the influence of churchmen in the RSE early in the nineteenth century and how the literary class of the RSE faded out, leaving it a society increasingly dominated by professional scientists. Nevertheless, leading churchmen including moderates such as William Robertson, Hugh Blair and John Walker had been instrumental in its creation, so too had critics of the moderate clergy, including Andrew Hunter and John Macfarlan. Knowledge of science or an interest in earth history was not simply limited to one faction within the church. Leading churchmen from different factions and in different parts of Scotland were involved in its foundation and early development.

Conclusion to Chapter Three

This chapter has explored different sources of information about ministers' engagement with science and the natural environment. It has demonstrated the exposure of ministers to science in the arts curriculum in Scottish universities; highlighted their attitudes towards inoculation; and the contribution made by leading clergy in the early years of the RSE. The evidence from the universities is that, as the century progressed, ministers were being taught a growing range of subjects relating to the natural environment. They were encouraged to study natural history and natural philosophy by professors who were enlightenment luminaries and who promoted the study of the natural world as both practically useful and morally uplifting. The evidence noted above from John Anderson's *Institutes of Physics*, Thomas Somerville, John Bethune, and Thomas Reid point to a common belief in the moral and spiritual benefit of the scientific study of the natural world. The pursuit of science was both theologically justified as well as contributing towards practical improvement. In consequence it is not surprising that ministers were interested and supportive of science and learning about the natural environment. This provides the background to examine ministers' descriptions of the natural environment in the OSA.

⁷⁹ Sher, *Church and University*, p. 302.

Chapter Four: The Statistical Account of Scotland and its Antecedents

This chapter explores the background to the *Statistical Account of Scotland* (OSA).¹ The purpose of the chapter is to explore ministerial involvement in antecedents to the OSA, any evidence of earlier interest in environmental issues and their familiarity with dealing with written enquiries and travellers' requests for information. It begins by considering the use of questionnaires as a tool of inquiry in natural history; examines ministers' contributions to Sibbald's proposed atlas of 1682; to Macfarlane's geographies; and ministers' contributions to travellers' writings about Scotland, particularly those about the highlands and islands. One minister, John Walker wrote a pioneering study of the natural history of the islands. The chapter goes on to examine the pivotal role of Sir John Sinclair in developing the OSA and in successfully bringing it to completion.

Questionnaires

Since Sir John Sinclair used questionnaires to guide the entries written by ministers, this chapter begins by considering the use of proformas with questions as a tool of inquiry in natural history. Sinclair went into more detail than many of his Scottish predecessors who had also used questionnaires (such as sir Robert Sibbald or William Maitland) in providing a long list of 160 questions, but he was following in a tradition of enlightenment inquiry that was well established and was, by the 1790s, familiar to Church of Scotland ministers.

The Royal Society of London played an important role in the development of questionnaires. The first Secretary of the Society, Henry Oldenburg, sent out lists of questions to correspondents around the world to gather information on natural history.² In 1666 Robert Boyle published a template for such inquiries in the *Transactions* of the Royal Society entitled: 'General Heads for a Natural History of a Country, Great or

¹ The Statistical Account of Scotland is referred to as the OSA (Old Statistical Account) to distinguish it from the New Statistical Account of Scotland (NSA) published from 1834-1845.

² Jordan Avramo, 'Letters and questionnaires: the correspondence of Henry Oldenburg and the early Royal Society of London's inquiries for natural history', in *Empires of Knowledge: Scientific Networks in the Early Modern World*, (ed.) Paula Findlen (Abingdon, 2019), pp. 161-180.

Small'.³ Adam Fox has described how the use of questionnaires spread across Britain and Ireland following the example of the Royal Society.⁴ In Yorkshire in 1683, for example, a physician, Nathaniel Johnston, published a list of questions seeking information from the clergy of each parish to help him write a county history.⁵ Similarly in Wales, in 1696, Edward Lhwyd circulated 4,000 copies of a questionnaire to all parishes, containing thirty one questions on natural history, antiquities and other details of the parish.⁶

In Scotland, Sir Robert Sibbald (1641-1722), Geographer Royal from 1682, used a questionnaire to gather information for his proposed *Atlas Scotica*.⁷ Sibbald's atlas was designed to be both of interest and useful, as described in the prospectus of 1683: 'Geography is worthy of all praise: because it both affordeth matter of much delight, and likewise is of much use for the life of man.'⁸ Sibbald's questionnaire contained general queries to furnish information for his Atlas with specific questions aimed at the nobility, clergy, and gentry. Lee Raye has suggested that Sibbald drew on over seventy local sources, including members of the clergy.⁹ Withers has identified twenty five named members of the clergy who were contributors along with anonymous contributions from five presbyteries.¹⁰ The atlas did not come to fruition, but both the ambition, the use of a questionnaire and involvement of the clergy foreshadowed what was to come in the OSA.¹¹

³ 'General Heads for a Natural History of a Country, Great or Small, Imparted Likewise by Mr Boyle', *Philosophical Transactions*, no. 11 (1666), pp. 186-189.

⁴ Adam Fox, 'Printed questionnaires, research networks, and the discovery of the British Isles, 1650-1800', *The Historical Journal*, vol. 53 (2010), pp. 593-621.

⁵ Fox, 'Printed questionnaires', p. 601.

⁶ Fox, 'Printed questionnaires', p. 603.

⁷ Sir Robert Sibbald, *An account of the Scottish atlas, or, The description of Scotland ancient & modern* (Edinburgh, 1683).

⁸ Sibbald, *An account of the Scottish atlas*, p.1.

⁹ Lee Raye, 'Robert Sibbald's Scotia Illustrata (1684): a faunal baseline for Britain', *Notes and Records: the Royal Society journal of the history of science*, vol. 72 (2018), pp. 383-405.

¹⁰ Charles W.J. Withers, 'Geography, science and national identity in early modern Britain: The case of Scotland and the work of Sir Robert Sibbald (1641-1722)', *Annals of Science*, vol. 53 (1996), pp. 29-73. The article includes the list of questions published by Sibbald (Appendix III) and the list of respondents (Appendix IV).

¹¹ Kelsey Jackson Williams, *The First Scottish Enlightenment: Rebels, Priests, and History* (2020, Oxford), pp. 195-207.

Following Sibbald's inquiry, Walter Macfarlane (1705?-1767) created an archive of writings about Scotland's environment in the 1720s. Macfarlane's manuscript collections included descriptions of local areas, particularly in the north and east of Scotland. The manuscripts were edited into three volumes by Arthur Mitchell for the Scottish History Society and published in 1906.¹² Volume I contains contemporary accounts of Scottish parishes, containing topographical and antiquarian contents. Many of the contributions were anonymous but five can be identified as ministers, as listed in table 6 below.

Table 6: Clergy in Macfarlane's Geographical Collections

Name given by Macfarlane	Biographical details
Mr. Gordon, the minister of Alford	James Gordon, M.A. (? -1749); minister at Alford (1717-1736), Moderator of General Assembly (1734), translated to Alloa (1736-1749). ¹³
Rev. John Ramsay	Possibly the rector of St. James, Stonehaven Scottish Episcopal Church (1741- 1744). ¹⁴
Alexander Garioch, minister of Midmar	(1677-1758) educated at King's College, Aberdeen, assistant schoolmaster, Carnbee (1696-1697), minister at Midmar (1717-1758). ¹⁵
Alexander Hepburn, minister of St. Fergus	(1656?-1737), M.A. King's College, Aberdeen (1676); minister (1703-1716), departed following his 'complicity in the rebellion', retired to Peterhead. Author of "A Description of Buchan in 1721" in Macfarlane's Geography. ¹⁶
John Taylor, minister of Dron	Minister at Dron, Perth. 1682-1689. 'A riot took place when the edict for his settlement was being served, on which the Privy Council ordered the Marquess of Atholl to hold courts and punish those responsible.' He was deprived by the Committee of Estates on 17th May 1689. ¹⁷

¹² Arthur Mitchell (ed.), *Geographical collections relating to Scotland made by Walter Macfarlane*, 3 vols. (Edinburgh, 1906).

¹³ Fasti, vol. VI, p. 118; Fasti, vol IV, p. 292.

¹⁴ List of ministers on the website of St. James the Great Scottish Episcopal Church, Stonehaven: <https://www.stjames-stonehaven.org.uk/exhibition/product-category/history/> (accessed 3 December 2024).

¹⁵ Fasti, vol. VI, p. 108.

¹⁶ Fasti, vol. VI, p. 240.

¹⁷ Fasti, vol. IV, p. 202.

An example is the entry for the 'Country of Garioch' in Aberdeenshire by 'Mr. Gordon, minister of Alford, 1724, and Mr. William Robertson'. The description is eighteen pages long and includes information on sixteen parishes. The account is primarily topographical, describing the landscape, listing hills, rivers, houses and their owners, churches and ancient monuments. There are some references to economic activity, for example a brief description of the hill of Foudlane 'where is a great Quarry of bleu slate which supplies the Countrey with slate.'¹⁸ The same entry describes the village of Old Meldrum, a 'Burgh of Barony, has 2 cross streets, one lying from W. to E. another from S. to N. has a considerable number of good ston-sclated houses. Has a convenient mercat place with a tolbooth. In this toun is kept an excellent Weekly Mercate, with severall yearly Fares. It depends on the Laird of Meldrum its Superior.'¹⁹

Another contributor (not necessarily a minister) touched on environmental and economic themes in a description of Peterhead.

There are two good harbours which will receive ships of a considerable burden, a large and safe Road, so that in storms ships can gett in here and be safe, much more easily and reddily, than in any other place betwixt the two Scotch firthes, ther's a great fishing here, it's to be observed that every Parish on the Butliquhan Coast hath one fisher toun at least, and many of them have two.'²⁰

There follows a long list of fish and shellfish caught locally including 'Codfish small and great, Turbet, Scate, Mackrel, Haddocks, whittings, Flooks, Sea dogs and Sea Catts, herrings, seaths, podlers, Gaudnes, Lobsters, partens and several others.' The Geographical Collections predate the OSA, but the contents and interests of the authors are similar to those in the later work. In common with earlier contributions of ministers to Sibbald they indicate that an interest in chorography and the natural environment among the Scottish clergy was not new and predated the OSA.

The clergy were also the recipients of an inquiry by questionnaire by William Maitland, who proposed to write a history of Scotland. In 1741 he prepared a 'large set of queries, with a general letter, and transmitted both to every clergyman in Scotland'. However, it was later reported that 'the return fell so very far short of his expectation, that he laid

¹⁸ Mitchell, *Geographical collections*, p. 11.

¹⁹ Mitchell, *Geographical collections*, p. 11.

²⁰ Mitchell, *Geographical collections*, p. 39.

aside his design in disgust'.²¹ Maitland highlighted one of the principal challenges of gathering information by questionnaire; how to persuade recipients of questionnaires to respond. This was a challenge that Sinclair later faced, and overcame, as discussed below.

Webster's Census of 1755

Ministers were also required to provide data by the Church of Scotland, for example on the population of the parish. Alexander Webster (1707-1784) was minister at the Tolbooth Church in Edinburgh from 1737. With Robert Wallace he prepared a scheme to provide annuities for widows of clergymen and professors, one of the earliest known schemes in Britain. The scheme was adopted by an Act of the Assembly in 1743. The scheme required actuarial data on life expectancies to calculate contributions and payments and to gather this data Webster had been in contact with ministers for some years.²² Appointed Moderator of the General Assembly in 1753 he was also a member of the Committee of the Society in Scotland for the Propagation of Christian Knowledge (SSPCK). It was in this position that Webster asked presbyteries with SSPCK funded ministers to complete an account of the population of their parishes supplying information on the length and breadth of parish, total number of inhabitants and numbers of 'papists, protestants and fighting men'.²³

The request for information came with a warning: if an SSPCK minister did not return the required information then their future funding might be put at risk. The survey was subsequently widened to include all presbyteries across Scotland. The data collected was collated into tables by county from which Webster calculated that the total population of Scotland in 1755 was 1,265,380. Written reminders sent out on behalf of Webster suggest some ministers did not respond quickly. Webster was successful in

²¹ Paul Baines 'Maitland, William, c. 1693–1757', entry in ODNB. It is not certain whether 'every clergyman' refers solely to the Church of Scotland or to ministers and preachers of all denominations.

²² A. J. Youngson, 'Alexander Webster and his "Account of the number of people in Scotland in the year 1755"', *Population Studies*, vol. 15 (1961), pp. 198-200.

²³ James Gray Kyd (ed.), *Scottish population statistics, including Webster's Analysis of population 1755* (Edinburgh, 1975), p. 8.

collecting data from across the country, creating the first reasonably reliable national census of population for Scotland.²⁴

Webster's survey predated the OSA by 40 years but offers some parallels. It showed that a nationwide survey was possible with ministers acting as agents in collecting national data. The distribution of ministers across all parts of Scotland, their educational background, and presbyterian organisation made national surveys possible. Not all ministers were enthusiastic about responding, as Sinclair discovered but with some cajoling, they were generally able to respond. It also carried some warnings: ministers would not necessarily reply quickly and reminders or even arm twisting might be necessary to get results; and that the quality of the individual returns might be variable. A study by Alistair Mutch of record keeping in the Church of Scotland has gone further to argue that ministers were subject to regular demands for detailed information about their parish, institutionalised as 'a systemic form of authority based on detailed record keeping'.²⁵ Like it or not, ministers were used to answering written demands for information as part of their professional lives.

Travellers and Writers

Another antecedent to the OSA was the participation of ministers in travel writing. Ministers helped travellers gather information on natural history and other subjects. Scotland, and particularly the highlands and islands, was visited by an increasing number of travellers through the eighteenth century some of whom recorded their impressions and observations in writing. There is now a considerable literature about travel writing in eighteenth century Scotland, including reprints of visitors' accounts, commentaries and anthologies.²⁶ Ministers appear in the accounts, sometimes as travellers, often as hosts accommodating visitors, and sometimes as sources of local

²⁴ Michael Anderson, 'Guesses, estimates and adjustments: Webster's 1755 census of Scotland revisited again', *Journal of Scottish Historical Studies*, vol. 31 (2011), pp. 26-45. Additional information on the population of the highlands and islands was also provided in 1760 in a report commissioned by the General Assembly of the Church of Scotland from John Hyndman and Robert Dick. A summary of the data they collected was subsequently published as appendix 12 of Pennant's *Tour of Scotland* of 1772.

²⁵ Alistair Mutch, *Religion and National Identity: Governing Scottish Presbyterianism in the Eighteenth Century* (Edinburgh, 2015), p. xv.

²⁶ Recent introductions include John Bonehill, Anne Dulau Beveridge and Nigel Leask (eds.), *Old Ways New Roads: Travels in Scotland 1720-1832* (Edinburgh, 2021), which contains a detailed bibliography; and Nigel Leask, *Stepping Westward: Writing the Highland Tour c. 1720-1830* (Oxford, 2020).

information or correspondents. There are too many travel writers to describe in detail but one of the most significant who engaged closely with the clergy was Thomas Pennant.

Thomas Pennant (1726-1798)

Thomas Pennant was a writer, naturalist, traveller and correspondent, whose accounts of tours in Scotland and Wales set a standard for later travel writing. He gathered material first hand; from questionnaires; from his observations and impressions; from those he met and stayed with on his travels, including Church of Scotland ministers; and from his correspondents.²⁷ Extremely well informed on a range of subjects, his correspondents included Carl Linnaeus, Joseph Banks, and Gilbert White of Selborne. Pennant made two tours of Scotland, the first of which was in 1769 from which he published *A Tour in Scotland 1769* in 1771.²⁸ In the appendix to the *Tour*, Pennant published a list of questions relating to the parish and its natural history that he had circulated in advance of his visit.²⁹ Similarly, in preparation for his tour of 1772 Pennant published a questionnaire, addressed to 'every Gentleman desirous to promote the Publication of an Accurate Account of the Antiquities, Present State, and Natural History of Scotland'.³⁰ This was published in the *Scots Magazine* of April 1772 and included twenty two questions relating to a range of subjects including natural history, population, farming and antiquities.

Pennant engaged widely with clergy during his tours and wrote a short passage highlighting their merits.

The clergy of Scotland, the most decent and consistent in their conduct of any set of men I ever met with of their order, are at present much changed from the furious, illiterate, and enthusiastic teachers of the old times, and have taken up the mild method of persuasion, instead of the cruel discipline of corporal punishments. Science almost universally flourishes among them and their discourse is not less Improving than the table they entertain the stranger at is decent and hospitable.³¹

²⁷ Pennant's correspondence with John Stuart and others is available on the Curious Travellers website: <https://curioustravellers.ac.uk/en/>.

²⁸ Thomas Pennant, *A Tour in Scotland 1769* (Edinburgh, 2000).

²⁹ Fox, 'Printed questionnaires', p. 613.

³⁰ *The Scots Magazine*, April 1772, pp. 173-174.

³¹ Pennant, *A Tour in Scotland 1769*, p.143. Pennant includes an appendix containing an account of the Church of Scotland, its ministers and Presbyterian governance (pp. 235-260).

In his second tour, Pennant was accompanied by two clergymen: John Lightfoot (1735-1788), Anglican chaplain and librarian to Margaret Bentinck, Duchess of Portland; and John Stuart (1743-1821), later minister at Luss and a founding Fellow of the Royal Society of Edinburgh. They were also accompanied by an artist, Moses Griffith, who prepared illustrations for the subsequent guide *A Tour in Scotland, and Voyage to the Hebrides*, 1772, published in two volumes in 1774 and 1776.³²

The travellers departed by boat from Greenock and sailed around the Mull of Kintyre to visit Jura, Mull and Skye. Lightfoot, a keen botanist, used information gathered on the journey to great effect, collecting botanical samples from which he subsequently published *Flora Scotica*, the first authoritative description of the flowering plants of Scotland.³³ Pennant's account mentions fifteen ministers (listed in appendix four), whom he met, stayed with or corresponded with. They included two on Skye, Donald MacQueen at Kilmuir on Trotternish and Martin MacPherson at Sleat, both of whom later acted as hosts to Samuel Johnson and James Boswell. His judgment of the ministers he met that 'science almost universally flourishes among them', is strong evidence that the clergy of the highlands and islands were interested in the natural environment and open to its scientific investigation.

Samuel Johnson and James Boswell

A further example of ministerial involvement with travellers comes from the tour of Johnson and Boswell in 1773.³⁴ They met, dined or stayed with several ministers of whom eleven are mentioned in Boswell's *Journal*. Johnson's account was relatively short, with generic observations about the landscape, language and culture that were often judgmental, and sometimes inaccurate or patronising. For example, he claimed: 'Yet what the Romans did to other nations, was in a great degree done by Cromwell to the Scots; he civilised them by conquest, and introduced by useful violence the arts of peace. I was told at Aberdeen that the people learned from Cromwell's soldiers to make

³² Thomas Pennant, *A Tour in Scotland, and Voyage to the Hebrides*, 1772 (Edinburgh, 1998).

³³ John Lightfoot, *The Flora Scotica: or, a systematic arrangement, in the Linnaean method, of the native plants of Scotland and the Hebrides* (London, 1777), a substantial account of over 1100 pages in two volumes with illustrations by Moses Griffith.

³⁴ Samuel Johnson, *A Journey to the Western Islands of Scotland* originally published 1775, revised edition (London, 1791); James Boswell, *The Journal of a Tour to the Hebrides with Samuel Johnson, LL.D.* (London, 1785).

shoes and to plant kail.’³⁵ Johnson’s critical judgements in the *Journey* did much to strengthen his reputation for ‘scotophobia’.³⁶

Unlike Pennant and his fellow travellers, Johnson reacted to the mountain landscapes of the western highlands with dismay rather than interest.

They exhibit very little variety; being almost wholly covered with dark heath, and even that seems to be checked in its growth. What is not heath is nakedness, a little diversified by now and then a stream rushing down the steep. An eye accustomed to flowery pastures and waving harvests is astonished and repelled by this wide extent of hopeless sterility.³⁷

There is little evidence in the account that Johnson was interested in the natural history of the highlands or had any great understanding of the landscape. Where Pennant, Lightfoot and Stuart took great pleasure in botanising, Johnson saw only a wasteland. ‘The appearance is that of matter incapable of form or usefulness, dismissed by nature from her care and disinherited of her favours, left in its original elemental state, or quickened only with one fallen power of useless vegetation.’³⁸ It may be that Johnson’s response to the scenery reflects his own mental health and his ‘melancholy’. Boswell recorded many such episodes in his *Life of Johnson* that have been interpreted as signs of depression.³⁹

Johnson’s account does not describe in detail the ministers he encountered but more information is given by Boswell in his *Journal* in which he recorded their daily progress. He mentioned Kenneth Macaulay (visited in Nairn on 27 August) who had ‘published the History of St. Kilda of which Mr. Johnson is fond’ and with whom they stayed at the manse; Martin Macpherson, minister of Sleat (6 September) who was ‘a very poor companion’; and Donald MacQueen (8 September), ‘a decent minister, an elderly man with his own black hair, courteous and rather slow of speech, but candid, sensible, and well informed, nay, learned’.⁴⁰ They travelled with MacQueen on Skye and Raasay,

³⁵ Johnson, *Journey*, p. 55.

³⁶ Murray Pittock, ‘Scotland’, in Jack Lynch (ed.), *Samuel Johnson in Context* (Cambridge, 2011), pp. 329–336.

³⁷ Johnson, *Journey*, p. 84.

³⁸ Johnson, *Journey*, p. 84.

³⁹ Allan Beveridge, ‘Talking about Madness and Melancholy: Boswell’s Life of Samuel Johnson’, *Advances in Psychiatric Treatment*, vol. 19 (2013), pp. 392–98.

⁴⁰ Boswell, *Journal*, p. 126.

staying for some days at Dunvegan with Norman MacLeod, the clan chief. MacQueen was pressed by Johnson on whether there was evidence of 'second sight' on the island, which MacQueen denied. Boswell recorded the scene:

Mr. Johnson told Mr. Macqueen that he had found the belief of the second sight universal in Skye, except among the clergy, who seemed determined against it. Say they "The world takes us to be credulous men in a remote corner. We'll show them that we are more enlightened than they think." The worthy man said that his disbelief of it was from his not finding sufficient evidence. But I could perceive that he was prejudiced against it.⁴¹

Boswell's comments on Macqueen supports the judgment of Thomas Pennant that the Church of Scotland ministers were educated, sceptical and enlightened. Johnson was also positive about the ministers he met:

Ministers in the Islands had attained such knowledge as may justly be admired in men, who have no motive to study, but generous curiosity, or, what is still better, desire of usefulness; with such politeness as so narrow a circle of converse could not have supplied, but to minds naturally disposed to elegance.⁴²

It was the contrast between such comments and the disparaging comments about other aspects of highland life that annoyed Donald MacNicol, minister of Lismore and led to him writing a scathing response. MacNicol was incensed by Johnson's comments on Gaelic: 'Of the Earse language, as I understand nothing, I cannot say more than I have been told. It is the rude speech of a barbarous people, who had few thoughts to express, and were content, as they conceived grossly, to be grossly understood.'⁴³

MacNicol, a Gaelic scholar and author of the statistical account of the parish, responded with feeling: 'This description in caricature which the doctor gives of the islanders in general, seems so much more inexplicable, that he speaks favourably of every individual whom he had occasion to know or converse with.'⁴⁴ MacNicol objected to the term 'Erse' which 'has a filthy sound, and I must reject it, as never being a word of ours'.⁴⁵ He protested further:

⁴¹ Boswell, *Journal*, pp.188-189.

⁴² Johnson, *Journey*, p. 241.

⁴³ Johnson, *Journey*, p. 267.

⁴⁴ Donald MacNicol, *Remarks on Dr. Samuel Johnson's Journey to the Hebrides; in which are contained, observations on the antiquities, language, genius, and manners of the highlanders of Scotland* (London, 1779), p. 215.

⁴⁵ Donald MacNicol, *Remarks*, p. 260.

To persons as ignorant of the language, and as prejudiced as the doctor appears to be, this bold assertion may pass for matter of fact. But those who know the Earse or Gaelic critically, know that our traveller has as much misrepresented our language as he has done our manners.⁴⁶

MacNicol's response reinforces the judgment of Pennant. Rather than Johnson, it is the ministers who appear reasonable and self-consciously attached to enlightenment values.

John Walker (1731-1804)

One of the most prominent ministers to tour the highlands and islands was John Walker.⁴⁷ Unlike Pennant who travelled out of curiosity, Walker was commissioned to travel north and to report back on his findings. In 1764 he was invited by the Commissioners of Annexed Estates to carry out a tour of the Hebrides to survey its natural resources and the opportunities they provided for development. He was, at the same time, asked by the SSPCK and Church of Scotland to prepare a report on state of religion in the islands.

Walker was educated at Edinburgh University where he attended classes in chemistry taught by William Cullen, whom he accompanied on field trips collecting rock and fossil samples. He studied theology and was admitted to the ministry in 1758, becoming minister at Moffat in 1762 and subsequently at Colinton from 1783.⁴⁸ His interests were wide ranging, including mineralogy, fossil hunting, agriculture and botany. From 1779

⁴⁶ MacNicol, *Remarks*, p. 291.

⁴⁷ The literature on John Walker is considerable. Matthew Eddy, has made a number of contributions including 'Geology, Mineralogy and Time in John Walker's University of Edinburgh Natural History Lectures', *History of Science*, vol. 39 (2001), pp. 95–119; 'The University of Edinburgh Natural History Class Lists', *Archives of Natural History*, vol. 30 (2003), pp. 97–117; *The Language of Mineralogy: John Walker, Chemistry and the Edinburgh Medical School* (Aldershot, 2008). Walker's contribution to botany is described by George Taylor 'John Walker, DD, FRSE, 1731–1803. A Notable Scottish Naturalist,' *Transactions of the Botanical Society of Edinburgh*, vol. 38 (1959), pp. 180–203. Margaret McKay has edited Walker's account of his trip to the Hebrides which contains detailed accounts of both the natural history and potential of the islands for economic development: *The Rev. Dr. John Walker's report on the Hebrides of 1764 and 1771* (Edinburgh, 1980). Charles Withers has described Walker's work as both a natural historian and as an agricultural improver: 'The Rev. Dr John Walker and the practice of natural history in late eighteenth century Scotland', *Archives of Natural History*, vol. 18 (1991), pp. 201–220; and 'A neglected Scottish agriculturalist: The geological lectures and agricultural writings of the Rev. Dr. John Walker (1731–1803)', *Agricultural History Review* (1985), vol. 33, pp. 132–146. Walker's lectures have been edited by Harold William Scott *Lectures on geology, including hydrography, mineralogy, and meteorology, with an introduction to biology* (Chicago, 1966).

⁴⁸ Margaret M. McKay, *The Rev. Dr. John Walker's Report on the Hebrides of 1764 and 1771* (Edinburgh, 1980), pp. 1–2.

he was Professor of Natural History at the University of Edinburgh, a position that he held concurrently with his ministry and which drew criticism from his parishioners that he was spending insufficient time in the parish.⁴⁹ Among other appointments he was the first joint secretary of the physical section of the Royal Society of Edinburgh (1783-1796) and Moderator of the General Assembly in 1790.

The Commissioners of the Annexed Estates managed the estates forfeited to the Crown after the 1745 rebellion. Although most of the annexed estates had been sold off, thirteen remained under the management of the Commissioners ‘for the Purposes of civilising the Inhabitants upon the said Estates...and promoting among them the Protestant religion, good Government, Industry and Manufactures.’⁵⁰ The Commissioners paid Walker an initial sum of £60 with instructions drafted by Lord Kames ‘to examine the natural histories of these countries, their population, and state of their agriculture, manufacture and fisheries’.⁵¹

The report of the 1764 tour was submitted to the Commissioners but only published in 1980 by Margaret MacKay.⁵² It describes the tour island by island, though not in the chronological order of the tour. The voyage commenced in Greenock ‘in a custom house wherry’ from where Walker sailed to Campbeltown, visiting Islay and Colonsay in June; Iona, Mull, Coll, and Tiree in July, then on north to Barra and the other outer isles arriving in Stornoway in August. He returned to Moffat in December with a collection of plants, stuffed birds, fishes, and insects preserved in spirits.

The report commenced with an address ‘To His Majesties Commissioners at the Board of the Annexed Estates’ in which Walker explained that his purpose was to report on the ‘Improvement of these wild and remote Parts of the Kingdom’. He then listed his proposed headings.⁵³

- A general description of the countries
- Soil and climate
- Customs and manners of the people
- Prices of labour and of commodities

⁴⁹ McKay, *Report on the Hebrides*, pp. 3-4.

⁵⁰ McKay, *Report on the Hebrides*, p. 6.

⁵¹ McKay, *Report on the Hebrides*, p. 6.

⁵² McKay, *Report on the Hebrides*, p. v.

⁵³ McKay, *Report on the Hebrides*, p. 33.

- Nature and extent of exports and imports
- Causes of population and depopulation
- The present state of agriculture, manufacture and fishery and how they might be improved
- Natural history, included as it ‘affords such frequent and favourable opportunities of turning the truths of science to the purposes of life’

Walker’s report was not as systematic or consistent as his address claimed and his descriptions of the islands he visited were variable in length and content. For example, the account of Tiree (1,681 inhabitants) covered thirteen pages with thirty-two section headings, compared to four pages and six section headings for North Uist (population over 2,400).⁵⁴ The description of Jura included three pages on topography, geology, and the whirlpool of Corryvreckan. It also included an account of experiments Walker conducted with a barometer and thermometer to determine the height of the mountains.⁵⁵ The description of Iona (population of about 200) ran to twelve pages with seven pages devoted to history and archaeology.

Walker did not always make clear the extent to which island ministers or others contributed to his research although he did give a few examples. He noted that some ministers were recording the population of their parishes. For example on North Uist: ‘there is one parish and the minister lately made an accurate account of the population of 2,465’.⁵⁶ Similarly for Colonsay, he reported that a list taken by the minister in 1766 amounted to 760 people.⁵⁷ For Eigg he engaged a ‘sensible and careful man who is a catechist in the parish’ to make an accurate roll of the inhabitants.⁵⁸

Walker’s report is an important antecedent to the OSA for several reasons. It demonstrated an interest in the natural environment that was both scientific and utilitarian. The purpose of the exercise was to furnish information for the improvement and good government of the islands, which reflected Sinclair’s intentions for the OSA for Scotland as a whole. The seven headings Walker proposed in his address (but did not adhere to) are shorter and simpler than the list of questions sent to ministers by Sinclair

⁵⁴ McKay, *Report on the Hebrides*; Tiree, pp. 179-191, and North Uist, pp. 63-66.

⁵⁵ McKay, *Report on the Hebrides*, p. 114

⁵⁶ McKay, *Report on the Hebrides*, pp. 63.

⁵⁷ McKay, *Report on the Hebrides*, p. 123.

⁵⁸ McKay, *Report on the Hebrides*, p. 223.

in 1790 but cover the same broad themes. Walker was interested in a range of natural phenomena, a keen observer and experimentalist but critical of theory: 'The method of enquiry which all our ingenious Theorists of the Earth have pursued is certainly erroneous. They first form an hypothesis to solve the phenomena, but in fact the Phenomena are always used as a prop to the Hypothesis.'⁵⁹ As described in chapter three, this reflects the empirical approach and 'Baconian mindset' that was dominant in Scottish natural history in the eighteenth century, combining observation, experiment and careful collation of evidence.⁶⁰ In collecting this information, it is evident that Walker was supported by ministers in gathering information such as population data. Moreover, as with Pennant and Webster it is likely that ministers played a role in providing accommodation and practical support to him. Walker was particularly important because, as noted above, he went on to inspire and encourage a generation of students in the study of natural history, including future ministers, when he was Professor of Natural History at Edinburgh University.

From these antecedents two conclusions stand out. First, that there was a longstanding interest in the natural environment among ministers, evidenced by their contributions to Sibbald and Maitland and their support to travellers such as Pennant. Second, there was a tradition of inquiry by questionnaire, both relating to the natural environment and, particularly for parish ministers, from the Church centrally, enquiring about population or other administrative and financial details. When Sinclair wrote in 1790 to ministers seeking detailed information under a variety of headings, the inquiry, while demanding, would not necessarily have been surprising to ministers.

⁵⁹ Harold W. Scott (ed.), *Lectures on Geology by John Walker* (Chicago, 1966), p. 27.

⁶⁰ Matthew D. Eddy, 'The Aberdeen Agricola: Chemical Principles and Practice in James Anderson's *Georgics and Geology*', in *New Narratives in Eighteenth-Century Chemistry* (Dordrecht, 2007), pp. 139-156, quotation from p. 149.

Sir John Sinclair and the Origins of the Statistical Account

Sir John Sinclair (1754-1835) of Ulbster, Caithness, was a landowner and tireless promoter of agricultural improvement.⁶¹ He was an MP for Caithness (and other constituencies) from 1780 to 1811 and closely associated with the government of Dundas and Pitt. He was the instigator and first chair of the Board of Agriculture in which capacity he commissioned the county agricultural surveys for all parts of the UK.⁶² In promoting the use of 'statistics' he brought a new vision of government informed by evidence, a vision that he pursued with impressive energy in the last decade of the eighteenth century. He kept detailed records of his work to develop the OSA which he subsequently published as the 'History of the origins and progress of the Statistical Account of Scotland'.⁶³ The development and management of the OSA is discussed in detail by Withrington and by Mitchison.⁶⁴ They note how Sinclair, while stressing his own originality, followed previous modes of inquiry, particularly that of the Society of Antiquaries of Scotland, which, in the decade preceding the OSA, had envisioned a similar parochial survey of Scotland. The proposal had been the initiative of Earl of Buchan, but the Society had neither the resources nor determination to implement the vision. It produced only five accounts, which were published in the first volume of the *Transactions* of the Society: some material from them was subsequently incorporated into the OSA.⁶⁵

Sinclair's own account, while not impartial, is a useful source of information, containing examples of his correspondence with ministers and others. The section that explains Sinclair's adoption of the words 'statistics' and 'statistical' is worth quoting in full:

Many people were at first surprised at my using the words "statistical" and "statistics", as it was supposed that some term in our own language might have

⁶¹ The most comprehensive biography of Sinclair is Rosalind Mitchison, *Agricultural Sir John: The Life of Sir John Sinclair of Ulbster, 1754-1835* (London, 1962); see also James E. Handley, 'Sir John Sinclair', *Innes Review*, vol. 8 (1957), pp. 5-18.

⁶² Rosalind Mitchison, 'The old board of agriculture (1793-1822)', *English Historical Review*, vol. 74 (1959), pp. 41-69.

⁶³ John Sinclair, 'History of the origins and progress of the Statistical Account of Scotland', OSA, vol. XX, 1798, pp. ix-cxv.

⁶⁴ Donald J. Withrington, *The Statistical Account of Scotland, vol. 1* (East Ardsley, 1983), pp ix-xlii; Rosalind Mitchison, *Agricultural Sir John: the life of Sir John Sinclair of Ulbster, 1754-1835* (London, 1962), pp. 120-136.

⁶⁵ Volume 1 of the *Transactions of the Society of Antiquaries* of Scotland published in Edinburgh in 1792 contained accounts of Aberlady, Haddington, Iona, Liberton and Uphall.

expressed the same meaning. But in the course of a very extensive tour through the northern parts of Europe, which I happened to take in 1786, I found that in Germany they were engaged in a species of political enquiry to which they had given the name "statistics," and though I apply a different meaning to that word—for by "statistical" is meant in Germany an inquiry for the purposes of ascertaining the political strength of a country or questions respecting matters of state—whereas the idea I annex to the term is an inquiry into the state of a country, for the purpose of ascertaining the quantum of happiness enjoyed by its inhabitants, and the means of its future improvement; but as I thought that a new word might attract more public attention, I resolved on adopting it, and I hope it is now completely naturalised and incorporated with our language.⁶⁶

For his tour of Northern Europe in 1786 Sinclair set out armed with a questionnaire of more than a hundred questions covering agriculture, commerce, government, revenue and the fighting strength of the countries he proposed to visit.⁶⁷ He travelled to Gothenburg, Copenhagen and Stockholm. There he took time to visit Uppsala about which he wrote 'I trod with emotion the small botanic garden honoured with the footsteps of Linnaeus.'⁶⁸ From Sweden he visited St. Petersburg and the court of Catherine the Great, returning to Britain via Berlin and Hanover, where it is likely that he learned about '*statistik*'. Armed with this evidence, he set out to put into action the best new European ideas about government.

The *Oxford English Dictionary* (OED) confirms the continental origins of the word 'statistics' citing usage in France and Germany.⁶⁹ In French *statistique* meant the study of 'a state, of statecraft, or of the conditions, circumstances, and politics of a state (1768)' and the study of numerical data concerning society (c.1785). In a study of the development of *statistik* in Germany, Johan Zande summarised its meaning as 'a kind of inventory of the state that described the present material condition of its territory and inhabitants, its laws, customs, and religion, its constitution and administration, and its material resources.'⁷⁰

⁶⁶ Sinclair, 'History' p. xiii.

⁶⁷ John Sinclair, *Memoirs of the Life and Works of the Late Right Honourable Sir John Sinclair, Bart.* (Edinburgh, 1837), p. 135.

⁶⁸ Sinclair, *Memoirs*, pp. 141-142.

⁶⁹ OED entry for 'statistics'.

⁷⁰ Johan Van der Zande, 'Statistik and history in the German Enlightenment', *Journal of the History of Ideas*, vol. 71 (2010), p. 415.

Sinclair was not the first to use the term ‘statistic’ in English as there were isolated examples of its use before 1790.⁷¹ Nevertheless, his hope that statistics would become ‘naturalised and incorporated’ into the language has certainly been fulfilled. In this endeavour Sinclair was partnered by Church of Scotland ministers. Together they helped establish one of the foundations of modern government: the extensive and ongoing collection of statistics for social, environmental and economic purposes.

Collecting the Data and Publishing the Results

Sinclair acknowledged some of the antecedents in his introduction to Volume XX of the Statistical Account.⁷² He referred to Webster’s census and made comparison between the population figures produced by Webster and his own figures. He also suggested that Thomas Pennant had considered some kind of account based on information received from ministers but had chosen not to pursue the project. If Sinclair was not suggesting a wholly new approach, the scale of his ambition and determination to see the project to a conclusion were impressive. From the initial request for information sent to ministers in 1790, it took seven years to gather the complete set of accounts and during this period Sinclair and his associates wrote on twenty five occasions to ministers, presbyteries and others requesting, encouraging and eventually begging them to return statistical accounts.⁷³

The first letter inviting ministers to write an account of parish was dated 25 May 1790, following the Church of Scotland General Assembly. The letter was printed and circulated to all ministers and took the form of a long questionnaire of 160 questions with a short introduction. Sinclair described the exercise as ‘an attempt, which may prove of considerable service to the country at large, and cannot fail to add to the reputation and character, which the Church of Scotland has already deservedly acquired for public utility.’⁷⁴ By the end of November he had received eighty five accounts, a good start but less than 10% of the total number of parishes. He sent out a reminder about the accounts in January 1791 urging clergy to ‘lose no time in sending

⁷¹ G. Udny Yule, ‘The Introduction of the Words “Statistics,” “Statistical” into the English Language’, *Journal of the Royal Statistical Society*, vol. 68 (1905), pp. 391-396.

⁷² Sinclair, ‘History’, pp. lxxviii-lxxx.

⁷³ Sinclair, ‘History’, appendices, pp. xviii-lix, contains Sinclair’s correspondence to ministers.

⁷⁴ Sinclair, ‘History’, appendix B, pp xviii-xxxiv.

them, the Public at large being extremely anxious, to have this Work brought to a conclusion.⁷⁵

The first volume was printed in May 1791. The introduction contained an exhortation to other ministers to submit their accounts and, in a move that may have confused its recipients, a suggestion that his initial questions should be considered ‘merely as a key to inquiry’. He added a shorter list of sixty six headings that might provide ‘the best mode of drawing up the Statistical Account of the different districts’.⁷⁶

Any illusions that the data would be collected quickly were soon dispelled and Sinclair was drawn into a long campaign to complete the project. As noted above, surveys using questionnaires typically produced a very limited response. What distinguished Sinclair’s work was his determined and repeated insistence that ministers respond to his inquiry. During 1793 no less than seven letters and reminders were sent out by Sinclair and others pressing ministers to respond, including supporting letters from two leading Church of Scotland ministers, Sir Henry Welwood Moncrieff and Dr Thomas Hardie. Moncrieff (1750-1827) was a prominent leader of the popular party in the General Assembly, suggesting that Sinclair’s project enjoyed support across factional divides within the Church. Hardie (1746-1798) was Professor of Ecclesiastical History at Edinburgh University and a member of the Moderate Party. William Robertson, Principal of Edinburgh University, and the SSPCK clerk, John Kemp, were also involved in persuading ministers to respond.

By 1795 Sinclair was imploring ministers to respond: ‘I beg that you would have the goodness to send me the Statistical Account of your parish’.⁷⁷ He also resorted to recruiting ‘Statistical Missionaries’ to send to different parts of the country to help in the project. The missionaries were not named but their destinations were listed with one sent to each of the following places: the Western Isles, Aberdeen and Banff, Dunkeld and Perth, Dumfries and Galloway, and Orkney. In a letter of January 1796, he admitted to a catastrophic error in losing a number of accounts and asked those unfortunate ministers whose accounts had been lost to resend them. Five letters of reminder were

⁷⁵ Letter from Sinclair dated 25 January 1791, in Sinclair, ‘History’, pp. xxxv -xxxvi.

⁷⁶ Introduction, OSA, Vol. I, 1791, pp. viii-x.

⁷⁷ Letter from Sinclair to ministers, 3 September 1795, in Sinclair ‘History’, pp. xlix-l.

sent out in 1796 and 1797, the last of which, dated 11 July, was written in red ink and directed at the six ministers whose parish accounts were still missing. The last account was received in January 1798.

In the introduction to Volume XX Sinclair explained the reasons why he believed ministers were reluctant to submit accounts. These included:

- Some ministers disliked the scheme
- Some ministers were prevented by old age or infirmity
- Jealousy of parishioners who suspected it was an excuse to increase taxes
- Tenants who were apprehensive to share information in case landlords increased rent.⁷⁸

This suggests that some ministers were held back by their congregations and prevented or delayed from responding for this reason. Whether this was an excuse for inaction and to what extent the collation of data was a collective response in some parishes is not known. There is also evidence to suggest that some ministers were frustrated by Sinclair's inconsistency in revising or adding to the questions directed at ministers.⁷⁹ This may have led to delays in responding.

Not all the accounts were written by ministers. A few were anonymous and some were written by other local contributors. For example, in the county of Aberdeen there were eighty two parish accounts, of which one (the city of Aberdeen) was anonymous, three were by 'friends to statistical enquiries' (Sinclair's statistical missionaries) and three by schoolteachers. Of the forty two parish accounts in the county of Dumfries, five were not by ministers, and in Fife, three of the sixty parish accounts were not written by ministers. By far the most serious gap is for the cities of Aberdeen, Edinburgh and Glasgow, where the accounts cannot be ascribed to ministers. Where possible, these and other accounts where the authors were not ministers have been excluded from the study.

⁷⁸ Sinclair, 'History', p. xvi.

⁷⁹ Letter from Robert Muter, minister of Kirkcudbright, to George Chalmers, in which he commented on Sir John Sinclair's additional questions: 'He changed his ground so often in the question he put to us at the commencement of the Statistical account that the most of us were bewildered in a labyrinth of inexplicable difficulties'. <https://stataccscot.ed.ac.uk/static/statacc/dist/tabular/correspondence> .

Publication

The twenty one octavo volumes were published by William Creech in Edinburgh between 1791 and 1799. He worked with Sinclair and others to print the accounts as they were received. One consequence of this approach was that the volumes of accounts were not organised geographically. The OSA was not published by county until the edition edited by Withrington and Grant in the 1970s. Subsequently, facsimiles of the parish accounts have been digitised and are now available online at the Edina website.⁸⁰ Sher has described the Statistical Account as the largest and most complex publishing project of the eighteenth century in Scotland. Financially, it was not the success that Sinclair had hoped. Creech ended with a warehouse of unsold volumes and became involved in an acrimonious dispute over the finances with Sinclair and the Society for the Benefit of the Sons of the Clergy.⁸¹

The OSA has provided for posterity a source of information, not only for parishes across Scotland but also on the interests and attitudes of its principal authors, Church of Scotland ministers. Historical research into the late eighteenth century Scotland has drawn heavily on the OSA and one researcher, Maisie Steven, has published an anthology of parish life, drawn from a study of the OSA.⁸² Her volume describes social and domestic life but does not explore in detail the environmental content of the accounts. Nor have other researchers used the OSA to explore the attitudes of ministers towards the environment, a gap this study seeks to address.

Conclusion to Chapter Four

Some of the elements that came together in the OSA were not new. Ministers had been involved in a range of related activities, including topographical writing, questionnaires, surveys and population censuses in the decades before the statistical accounts were written. Ministers also had experience of dealing with requests in writing from information gatherers, including Webster and, in parts of the country, the SSPCK. Ministers, particularly in the highlands, had acted as hosts and guides to travellers and their correspondents. In this context the request from Sinclair, although demanding,

⁸⁰ <https://stataccscot.edina.ac.uk/static/statacc/dist/home>

⁸¹ Richard B. Sher, *The Enlightenment and the Book* (Chicago, 2008), pp. 424-428.

⁸² Maisie Steven, *Parish Life in Eighteenth-Century Scotland* (Aberdeen, 1995).

was not necessarily novel. What was new were the scale of the project; the thoroughness with which Sinclair pursued it; and his ultimate success in gaining complete coverage (although of mixed quality) from every part of Scotland. This huge undertaking in data collection foreshadows later government censuses and surveys of the type now routinely deployed by governments across the UK.

With encouragement and cajoling by Sinclair, most ministers proved to be capable of writing a description of their parish and some were enthusiastic participants in the process. This required a significant amount of effort on the part of many ministers, who provided detailed answers over many pages to Sinclair's questions. Chapter five explores how ministers in different parts of Scotland responded to Sinclair's inquiry to produce descriptions of the natural environment in their parishes. Chapters six and seven go on to explore what ministers across Scotland were writing on flora, fauna and the physical environment. This offers the opportunity to search for evidence about their views on a wide range of subjects, including the history of the earth, views that may help us understand their passive response to Hutton's *Theory*.

Chapter Five: Environmental Issues in the Statistical Account

This chapter introduces ministers' writing about the environment in the OSA, drawing on a sample of parishes from different parts of Scotland. It describes how ministers responded to Sinclair's request for information in a way that reflected the interests of ministers and the circumstances of the parish, leading to accounts that differ in content and length. The chapter describes the accounts from six sample areas drawn from parts of Scotland with widely different environmental characteristics, from Argyll in the west, to Berwickshire in the east. It provides the background for a more detailed consideration of specific environmental subjects in chapters five and six.

Local Area Studies

The samples of parishes are drawn from across Scotland: from Argyll, Ayrshire, parishes around Edinburgh and Glasgow, and the lower Tweed valley (the Merse) near Berwick. The location of the sample areas is shown on the map in figure 3. The samples comprise forty nine parishes in total (out of 938 parish accounts across Scotland) chosen to represent parts of Scotland with different characteristics. Argyll and the Merse were both rural but with different climates, topography and soils. Parishes around Glasgow and Edinburgh were close to cities which had growing populations and which were experiencing rapid industrial and urban development. Ayrshire was a rural county experiencing some urban and industrial development.



Figure 3: Local area studies

The background map is from 1808, coloured to suggest the broad geological formations of Scotland as they were understood at the beginning of the nineteenth century, including blue for the southern uplands, yellow for the central belt and pink for the highlands.¹ The study areas and proportion of environmental subjects contained in the accounts are summarised in table 7.

¹ Louis Albert Necker, *Scotland Coloured According to the Rock Formations*. (London, 1809), reproduced from National Library of Scotland, <https://maps.nls.uk/view/216389912>, under Creative Commons licence <https://creativecommons.org/licenses/by-nc-sa/4.0/>.

Table 7: Summary statistics for parish samples

	Sample areas (from west to east)							Total
	1	2	3		4	5	6	
			3a	3b				
No of parishes in sample	7	8	5	5	7	9	8	49
Average length of account (pages)	17	15	8	23	19	16	14	16
Average length of account (lines)	416	390	184	579	489	411	335	400
Average length of text under Environment subject headings (lines)	251	201	101	281	218	130	194	196
Proportion of text under environment subject headings (%)	60	51	55	48	44	31	57	49
Key to sample areas: 1, Argyll islands; 2 North Argyll mainland; 3, Ayrshire (3a, Auld Licht ministers; 3b, New Licht ministers); 4, Glasgow district; 5, Edinburgh district; 6 The Merse (Lower Tweed Valley)								

The table shows, for each sample area, the number of accounts in the sample, the average length of the accounts (in pages and lines) and the proportion of the of the accounts under environmental subject headings. The top line in the table lists the sample areas, with Ayrshire divided into two smaller samples, ‘Auld Licht’ and ‘New Licht’ ministers, reflecting the factions in the Church in the county. The average length of the accounts in the sample areas is sixteen pages (400 lines). Other than the Ayrshire accounts, the range of average lengths in the samples is quite narrow, from fifteen pages for the north Argyll mainland parishes to nineteen pages for the Glasgow parishes.

The table shows that, across the samples, about half of the text of the accounts (49%) falls under environmental subject headings but with significant variations between areas. In some sample areas ministers wrote as much, if not more, about the natural environment than they wrote about their parishioners. For example, as a proportion of the total, ministers wrote most about environmental subjects in the Argyll islands (60%) and Berwickshire (57%) samples. The proportion was lowest in the Edinburgh (31%) and Glasgow (44%) samples. For the Ayrshire subsamples the figures are 55% for the ‘Auld Lights’ and 48% for the ‘New Lights’. These variations across Scotland can be explained in part by the different circumstances of the

parishes. In parishes around Glasgow and Edinburgh there were many urban and industrial developments that attracted ministers' attention, including the growth of the cities, coal mining and textile manufacture. In Argyll and the Merse of Berwickshire there was little industrial development, no coal mining and no towns of any size. Here ministers wrote relatively more about the natural environment and about agriculture. These issues are explored in more detail in the case studies below.

Environment Subject Headings

This section discusses what is meant by an 'environmental subject' and how environmental subject headings have been used to summarise the contents of the accounts. In 1790, in his first letter to ministers, Sinclair suggested the headings ministers might wish to consider in their accounts. He set out a long list of 160 questions, of which most of the first section of forty questions (geography and natural history) was concerned with environmental subjects.² A year later, in the introduction to the first volume of published accounts, he revised and simplified this to a shorter list of headings that clergy could use, of which nineteen have been identified as environmental subjects (see table 8 below).³ This change may well have caused confusion among respondents and the evidence from the accounts that Sinclair's suggestions were not followed by most ministers. This can be demonstrated by examining the responses from the sample of mainland parishes in Argyll, listed in table 8. The table shows how the ministers in this sample responded to Sinclair's suggested headings of 1791. Other than for two categories 'description of soil and surface' and 'lakes, rivers and other natural features' Sinclair's suggestions were taken up only in part.

² The original 160 questions are given in the introduction to the OSA, vol. XX, 1798, pp. xx-xxxiv.

³ The shorter list of subjects heading was printed in the introduction to the OSA, vol. I, 1791, pp. viii-x.

Table 8: Ministers' response to Sinclair's subject headings

No.	List of headings suggested by Sinclair	Argyll Parishes (see key below for parish names)							
		1	2	3	4	5	6	7	8
<i>Description of parish</i>									
1	Situation and extent of parish	X	X	X	X	X		X	X
2	Number of acres								
3	Description of soil and surface	X	X	X	X	X	X	X	X
4	Nature and extent of seacoast					X	X	X	
5	Lakes, rivers, other natural features	X	X	X	X	X	X	X	X
6	Climate and diseases			X		X	X		X
<i>Agriculture</i>									
7	Mode of cultivation		X		X	X	X		
8	Implements of husbandry								
9	Manures			X					
10	Seed time and harvest								
11	Remarkable instances of good and bad seasons								
12	Quantity and value of species of crops								X
13	Total value of produce		X	X		X	X		
14	Price and quantity of grain								
15	Number and value of horses, cattle, etc.	X	X	X		X	X	X	X
<i>Commerce</i>									
16	Manufactures						X		
17	Kelp manufacture			X					
18	Fisheries			X					
19	Minerals		X			X			
Key to parishes: 1, Ardchattan and Muckairn; 2, Glenorchy and Inishail; 3, Kilbrandon and Kilchattan; 4, Kilchrenan and Dalavich; 5, Kilmartin; 6, Kilmore and Kilbride; 7, Kilninver and Kilmelfort; 8, Lismore and Appin.									

The column on the left shows the environmental subject headings suggested by Sinclair in 1791 and the cells marked with an **X** indicate the accounts in which these subject headings were adopted by ministers. All ministers in the sample wrote about the soil and surface of the land, and about lakes, rivers, and other natural features. Most also wrote about the situation and extent of the parish and the number and value of horses and cattle. None wrote about the price of grain, which is perhaps not surprising in an area which was primarily pastoral and far from urban grain markets.

Only one minister included a description of manufacturing, again not surprising in an area of remote rural parishes with limited and expensive access to coal.

In his introduction to the reprinted OSA, Donald Withrington suggested that Sinclair abandoned attempts to organise and edit material into one standard format when the diversity and abundance of material he was receiving from ministers became apparent. Rather, the accounts were published with minimal editing, and with a more diverse range of section headings than Sinclair had intended.⁴ For these reasons the section headings give a good idea of the interests of ministers and can be used to assess the proportion of each account given to environmental subjects. An example comes from Ardchattan and Muckairn parish where the minister chose to use nine section headings.⁵ These are given in table 9 below.

Table 9: Section headings for Ardchattan and Muckairn

Section headings on environmental subjects (with lines of text)	Other headings (with lines of text)
Name, Extent, and Surface (22) Rivers, Hills, and Woods (27) Natural Productions (30) Horses, Cattle, and Sheep (22) Miscellaneous Observations (55)	Rent (11) Population (19) Stipend, Schools, and Poor (24) Roads, Services, and Fuel (17)

The figure given in brackets after each section heading indicate the number of lines of text under that heading so that, for example, there are twenty-two lines of text under the heading ‘Name, Extent and surface’, and twenty seven lines under ‘Rivers, Hills and Woods’. Four of the subject headings clearly relate to the natural environment but one ‘miscellaneous observations’ could cover anything. It is only through reading the text that it becomes clear that this is largely a description of Loch Etie (Loch Etive), its geography and history, so it has been included.

Other headings include three subject areas that are not related to environmental subjects (rent; population; stipend, schools and poor) but one (roads, services and fuel) that might possibly be. The text on roads is a short discussion on the mixed quality of the roads in the parish and the text on ‘services’ relates to feudal duties and

⁴ Donald Withrington, ‘General Introduction’ in John Sinclair, *The Statistical Account*, vol. ,1 (East Ardsley, 1983), pp xix-xx.

⁵ Ardchattan, County of Argyll, OSA, vol. VI, 1793, pp. 174-182.

the intention of proprietors to abolish servitude. The text on 'fuel' noted that peat was the principal fuel of many residents and called for repeal of the coal tax. While there is some environmental content, it is not the main subject of the section, so it has been excluded from the list. Some accounts include tables and long footnotes. Where tables have been used, they may include population data, lists of farm animals or other data. Footnotes cover a wide variety of subjects and tend to reflect the contents of the account. For the sake of simplicity and consistency, tables and footnotes have been excluded from the line count throughout the samples.

Environmental Issues in the Argyll Accounts

The eight parishes in the sample are from mainland north Argyll, an area on the west coast of Scotland with a distinctive environment: a long and indented coastline, many hills and mountains and a wet climate. It was largely rural, contained no large urban settlements, was Gaelic speaking and had poor communications by land to urban Scotland. Connections by sea were better but the area remained remote from the lowlands. Several themes emerge from the Argyll parish accounts. In all the accounts environmental subjects form a substantial part of the accounts and in some they represent the greater part of the text. Different elements of the natural world are included including lochs (often referred to as lakes), hills, soil, climate, flora and fauna and, in coastal parishes, the marine environment. Extracts from the account of the parish of Ardchattan by the minister Ludovick Grant are an example:

The surface is for the most part hilly and uneven, intersected with streams of water, and diversified with heights and hollows. In the parish are several rivers, abounding with excellent trout. The hills are mostly covered with grass... affording excellent pasturage for black-cattle and sheep.... The parish abounds with natural wood; and there are a few plantations of pines and Scotch firs. The woods consist of ash, birch, hazel, and alder, but chiefly oak.⁶

In Kilmartin, Hugh Campbell described the marine life:

There is a species of fish taken on this coast, which goes by the general name of Grey fish. They are of different sizes, most of them much larger than herrings., There are likewise in the Bay of Crinan, cod, ling, turbot, soles, etc. in great abundance; but the people are not skillful in catching them. Herrings are frequently taken in Loch Craignish and Loch Crinan, though not to any great extent; also the finest oysters that are any where to be found, and in great plenty. The other

⁶ Ardchattan, County of Argyll, OSA, vol. VI, 1793, p. 175. In this chapter and chapters below the named author of the account is the parish minister unless otherwise stated.

sea animals, are, seals, peltocks, otters, and some small whales, that come to the coast in pursuit of the herrings.⁷

While interested in the natural world, not all ministers were expert, for example John Macfarlane, minister at Kilbrandon and Kilchattan, who wrote an idiosyncratic description of the puffin: 'It is a species of duck, of a gray colour. It seldom attempts to fly, nor are the wings, which are very small and bare, capable to carry its weight to any considerable distance. It is almost entirely a lump of fat, and tastes of fish.'⁸

Ministers were aware of agricultural developments taking place elsewhere but noted the relative lack of improvement in Argyll. Hugh Campbell at Kilmartin noted: 'Remote Highland parishes, distant from the scenes of great and memorable events, backward in most kinds of improvements, particularly in agriculture, and without trade or manufactures, cannot be expected to furnish much matter for statistical inquiry.'⁹ Nevertheless, the accounts include commentaries on crops, cattle and sheep, manures, rotations and new agricultural practices. Ministers were sympathetic to improving landowners, quoting examples of good practice. John Macfarlane admired experiments by Campbell of Lochend, steward to the Earl of Breadalbane, to introduce new crops. 'It appears that turnip would prove a beneficial crop; and we have reason to believe, if the ground were properly enclosed, that pease and beans, if not wheat, might be raised to advantage.'¹⁰

Donald MacNicol on Lismore mentioned his own initiatives in reseeded the glebe.¹¹ Some ministers were aware of the consequences of change, both ecological and human, arising from more extensive sheep grazing. For example, Patrick MacDonald at Kilmore and Kilbride observed of sheep:

As they increase in numbers, they contribute much to wear off the heath; insomuch, that several hills, covered with it about 30 years ago, have now got a beautiful surface of grass; although, alas! at the expence of reducing the number of the poor farmers; many of the villages being quite depopulated.'¹²

In one way, at least, ministers were involved in promoting change. Some of the accounts mentioned the iniquity of the coal tax, and its negative effects on remote

⁷ Kilmartin, County of Argyll, OSA, vol. VIII, 1793, p. 92-93. A 'peltock' was a porpoise.

⁸ Kilbrandon and Kilchattan, County of Argyll, OSA, vol. XIV, 1795, p. 168.

⁹ Kilmartin, p. 90.

¹⁰ Kilbrandon and Kilchattan, p.158.

¹¹ Lismore and Appin, County of Argyll, OSA, vol. I, 1791, p. 489.

¹² Kilmore and Kilbride, County of Argyll, OSA, vol. XI, 1794, p. 128.

parishes. The tax made coal expensive to import as a source of fuel, both for domestic heating, and for industrial purpose such as manufacturing agricultural lime. In the acid soils of Scotland absence of agricultural lime was a constraint on soil fertility.¹³ The complaints against the coal duty were repeated by ministers in accounts elsewhere in the highlands and were noted by Sinclair who was effective in lobbying the Government for its repeal in 1792.¹⁴ In the Argyll accounts there is little evidence of any perceived contradiction between the quality of the natural environment and 'improvement' and no mention of conservation of species or habitats.

Many ministers were aware of the rocks and minerals and how they related to different types of soil. Donald MacNicol, for example, explained how Lismore's favourable soil was due to the underlying limestone: 'The Island of Lismore...is founded totally on lime-stone rock. The soil is rich, consisting of black soft loam, formed from the surface of the lime-stone mouldered down, and produces much grain.'¹⁵ John MacFarlane at Kilbrandon and Kilchattan likewise was aware of different types of soil and their association with different underlying rocks:

Part of it is black, and part red hazel loam. The black is by far the most fertile, and generally covers either slate or lime-stone. The red loam is commonly mixed with whinstone, and though in good heart, is easily exhausted.¹⁶

While most of the descriptions are factual and utilitarian there are some examples of descriptions written in a romantic style, for example by Joseph MacIntyre at Glenurchy and Inishail:

Beindoran, till lately, was the residence and sanctuary of the roe buck and mountain deer; but now, the hunter roams no longer on the hill of the chace; the sheep browse on the heath of the forest, and the sons of the mountains have deserted the inheritance of their race for ages, to revisit its springs, and glades, and secret haunts no more! Formerly, the wolf had his haunts in our wilds and mountains, and not only proved fatal to the cattle, but, when impelled by hunger,

¹³ Robert A Dodgshon, 'Land Improvement in Scottish Farming: Marl and Lime in Roxburghshire and Berwickshire in the Eighteenth Century', *Agricultural History Review*, vol. 26 (1978), pp. 1-14.

¹⁴ See Donald Withrington 'General Introduction' in Donald J. Withrington, and Ian R. Grant, *The Statistical Account of Scotland, 1791-1799*: vol. 1 (Ardingley, 1973), p. xli.

¹⁵ Lismore and Appin, p. 483.

¹⁶ Kilbrandon and Kilchattan, p. 158.

or inflamed with rage, he even, at times, made depredations on the human species.¹⁷

Themes that were repeated by ministers in these accounts include the remoteness of Argyll, the lack of improvement and an environment that was rich in biodiversity but extremely challenging to farm. The same themes are repeated in the section below on the Argyll islands, sometimes in more extreme form.

Argyll Islands

Close to the mainland parishes are the Argyll islands, similar in topography but more isolated and experiencing a harsher maritime climate. Table 10 lists the eight parishes. Mull and Islay, the largest of the Argyll islands had three parishes each with Iona included in the Mull parish of Kilfinichen. Coll and Tiree, the most remote of the Argyll islands, formed one parish. The parish of Colonsay and Jura was exceptionally complicated as it also included the smaller inhabited islands of Oronsay, Scarba, Belnahua and Luing. The Presbytery of Kintyre directed that: ‘the minister shall preach six months and a half in Jura, and five and a half months at Colonsay, yearly’.¹⁸

Table 10: Environmental content of Argyll island accounts

Parish	Minister	Length of account		Environmental subject headings	
		Pages	Lines of Text	Lines of text	%
Coll and Tiree	Archibald McColl	25	679	362	53%
Kilchoman (Islay)	John MacLeish	12	247	136	55%
Kildalton (Islay)	Archibald Robertson	12	289	166	57%
Killarow and Kilmeny (Islay)	John Murdoch	5	105	67	64%
Jura and Colonsay	Francis Stuart	18	462	352	76%
Kilfinichen and Kilviceuen (Mull)	Dugald Campbell	41	1,001	666	66%
Kilninian and Kilmore (Mull)	Archibald McArthur	22	461	200	43%
Torosay (Mull)	Archibald McArthur	4	90	63	70%

¹⁷ Glenurchy and Inishail, County of Argyll, OSA, Vol. VIII, 1793, p. 343. This is consistent with travel writing of the 1790s as discussed in chapter six below; see also Elizabeth A. Bohls and Ian Duncan (eds.), *Travel Writing 1700-1830 An Anthology*, (Oxford, 2005), p. 96.

¹⁸ Fasti, vol. IV, p. 69.

Totals		139	3,334	2,012	60%
Averages		17	416	251	

The longest account was by Dugald Campbell of Kilfinichen and Kilviceuen on Mull, at forty-one pages, and the shortest that of John Murdoch at Killarow and Kilmeny on Islay at five pages. In all but one account (Kilninian and Kilmore on Mull by Archibald McArthur) environmental subjects make up more than half the text in the accounts and over threequarters in the account by Frances Stuart of Jura and Colonsay.

The accounts describe both the rich biodiversity of the islands and the challenges the environment provided to human activity: to farming, fishing, travel and trade and to ministers trying to carry out their duties. On Coll and Tiree Archibald McColl wrote about the lochs, with details of their number and area; he noted the remnants of former woodlands, the risk posed to grazing by sandstorms and the thin pasture growing on sandy soil that was very vulnerable to overgrazing, resulting in cattle starving in winter. He observed that: ‘Two-thirds of the whole arable ground are either too wet or too dry; and almost the whole surface is exposed to storms.’¹⁹ He concluded: ‘The black cattle and horses are mostly in a starving condition. The latter, when their pasture is very bare in winter and spring, tear up the ground with their feet to come at the roots.’²⁰ While McColl was conscious of the impact of the harsh environment, Dugal Campbell on Mull was impressed by the rich wildlife of his parish with land birds that included ‘eagles, hawks, kites, wild geese, pigeons, moor fowls, black cocks, tarmagans, &c.’²¹ Campbell included a list of seabirds and migratory birds: ‘The sea fowls are as numerous as the kinds are various; such as cormorants, scarts, teels, scale drakes, ducks of various kind, etc.’ He also noted seasonal birds: ‘The migratory are swans, swallows, cuckoos, lapwing, wood cocks, plovers, solon geese, curlews, widgeons, etc.’²²

Accounts included descriptions of topography and the weather. On Islay Archibald Robertson at Kildalton wrote knowledgeably about the topography of the southern

¹⁹ Tiree and Coll, County of Argyll, OSA, vol. X, 1794, p. 395.

²⁰ Tiree and Coll, p. 412.

²¹ Kilfinichen and Kilviceuen, County of Argyll, OSA, vol. XIV, 1795, p. 186.

²² Kilfinichen and Kilviceuen, p. 187.

coast and John Murdoch commented on the mildness of recent winters.²³ Francis Stuart, minister of Jura and Colonsay and a newcomer to the islands, was exceptional in including a romantic description of the mountains of Jura and the Correyvreckan whirlpool.²⁴ For other ministers the harshness of the environment and the hardship faced by the population were described in uncompromising terms.

All appeared to subscribe to a belief in 'improvement' but noted that its progress across the islands was patchy. Archibald McArthur on the Isle of Mull described a rural population struggling to thrive: 'The state of agriculture is very backward, owing chiefly to the rugged face of the ground, and forbidding nature of the climate.'²⁵ The combination of harsh terrain, poor soil, a wet climate and the lack of improvement of agriculture had trapped many in poverty. He was pessimistic about the prospects but called upon the heritors to make changes: 'From what has been already said of the soil, agriculture, and population of this parish, it will be readily believed, that many of our people are poor; and it is but too true.'²⁶

The only island where improvement was underway on any scale was Islay, where ministers applauded the ambitious landlord, Campbell of Shawfield, for his improvements to agriculture and the new settlement at Bowmore. The accounts of Islay suggest that it was relatively prosperous, in contrast to Pennant's earlier account of his tour of 1772, a year of famine, in which he reported widespread poverty on the island.²⁷ There may have been a rapid improvement in conditions on Islay but it is possible that ministers' admiration of Campbell of Shawfield's improvements influenced their writing. Even in the most remote islands of the west the clergy were firmly attached to 'improvement'.

Ayrshire Parishes

The Ayrshire parishes offer an unusual opportunity to examine the attitudes of different parties within the clergy, the moderates, referred to as 'New Lights' and their

²³ Kildalton, County of Argyll, OSA, vol. XI, 1794, pp. 288-292; Killarow and Kilmeny, County of Argyll, OSA, vol. XI, 1794, p. 300.

²⁴ Jura and Colonsay, County of Argyll, OSA, vol. XII, 1794, pp. 318-319, 323.

²⁵ Kilninian and Kilmore, County of Argyll, OSA, vol. XIV, 1795, p. 140.

²⁶ Kilninian and Kilmore, p. 149.

²⁷ Thomas Pennant, *A Tour in Scotland and Voyage to the Hebrides 1772*, Edinburgh (1998), p. 217.

opponents, described as ‘Auld Lights’.²⁸ This is possible because of the divisions that were manifest in a number of well documented disputes, including the trial in 1789 of William McCall, second charge in Ayr and a leading New Licht minister, accused of heresy by William Peebles, minister of the neighbouring parish of Newton. McCall and Peebles were authors of their respective parish accounts. The divisions in the church and the ministers were satirised by Robert Burns in poems such as ‘The Kirk’s Alarm’.²⁹ From the satires of Burns and research by Colin Kidd, it is possible to identify ministers from both parties who contributed accounts, as set out in table 11.

Table 11: Environmental content of Ayrshire accounts

Parish	Minister	Length of account		Environmental subject headings	
Auld Licht ministers					
		Pages	Lines of text	Number	%
Barr	Stephen Young	9	247	203	82%
Monkton and Prestwick	Andrew Mitchell	10	194	101	52%
New Cumnock	James Young	4	80	43	53%
Newton	William Peebles	13	315	114	36%
Riccarton	Alexander Moodie	4	84	47	55%
Totals (Auld Lights)		40	920	508	55%
Averages		8	184	101	
New Licht ministers					
		Pages	Lines of text	Number	Percent age
Ayr	William Dalrymple & William McGill	25	705	339	48%
Fenwick	William Boyd	16	406	297	73%
Kirkoswald	Matthew Biggar	27	655	321	49%
Stevenston	James Wodrow	41	979	406	41%
St. Quivox	William M’Quae	8	155	46	29%
Totals (New Lights)		117	2,895	1,409	48%
Averages		23	579	281	

²⁸ Colin Kidd, ‘Enlightenment and anti-Enlightenment in eighteenth-century Scotland: an Ayrshire-Renfrewshire microclimate’, in J.-F. Dunyach, and A. Thomson (eds.), *The Enlightenment in Scotland: national and international perspectives* (Oxford, 2015), pp. 59-84.

²⁹ Robert Burns ‘The Kirks Alarm’, in Andrew Noble and Patrick Scott Hogg (eds.), *The Canongate Burns* (Edinburgh, 2003), pp. 437-440.

Most striking is that New Licht ministers generally wrote much longer accounts than Auld Licht ministers. The five accounts from the Auld Licht ministers total forty pages (920 lines) of text, an average of eight pages (184 lines) of text for each account. In contrast the five New Licht ministers wrote 117 pages of text (2,895 lines) with an average of twenty three pages (579 lines) per account. The New Licht ministers were writing accounts that were on average over twice as long as their Auld Licht colleagues.

Environmental subjects form a substantial part of most of the accounts. On environmental subjects the five Auld Licht ministers wrote 508 lines of text, just over half (55%) of the total number of lines of their accounts. The New Licht ministers wrote 1,409 lines of text on environmental subjects, an average of 281 lines (48%) each. While the New Licht ministers wrote far more on environmental subjects, as a proportion it is a slightly smaller proportion of the total text (48%) than the Auld Licht ministers. Although the sample is small the data suggests that environmental subjects were of interest to all ministers, whether Auld or New Licht.

Agriculture

Ayrshire was a largely rural county and agriculture, farming, crops and woodland are covered extensively by ministers with sections on these subjects in all but two of the accounts (Newton and New Cumnock). The minister of Kirkoswald, Matthew Biggar, offered the most substantial account (nine pages) of agricultural change and sang the praises of the improving landlords, particularly Thomas Kennedy, Earl of Cassilis.³⁰ Both he and the minister at Fenwick, William Boyd, described a landscape that was devoid of ancient woodland, with recent plantations making up much of the woodland cover. In contrast to Kirkoswald, Boyd noted the lack of improvement in the parish of Fenwick: 'Improvements may be said to be only in their infancy; here the tenant goes on in the same old way that his father did before him.'³¹ Both Boyd and Biggar were New Licht ministers but the Auld Licht minister, Stephen Young, also commented on the lack of improvement in the upland parish of Barr:

³⁰ Kirkoswald, County of Ayrshire, OSA, vol. X, 1794, pp. 484-492.

³¹ Fenwick, County of Ayrshire, OSA, vol. XIV, 1795, p. 64.

This parish is partly arable, but consists principally of pasture-grounds. As to improvements or any sort, it may be said to be in its natural state. Though there is plenty of lime in the parish, yet the want of roads renders it difficult to procure coals, in order to prepare lime-stone for the purpose of improving the grounds.’³²

Young went on to make an impassioned plea for the introduction of Cheviot sheep to which he devoted half of his account of nine pages.³³ Young, lampooned as ‘Barr Steenie’ by Burns in the Kirk’s Alarm, appeared to be as enthusiastic about improvement as his New Licht colleagues. The Auld Licht minister of Prestwick and Monkton, Andrew Mitchell, was equally interested in soils and farming:

The soil of Monkton and Prestick is, in general, fruitful, diversified in its quality. Upon the E. and highest part of it, it is an earthy clay, in the middle, deep and loamy, and, as it approaches the sea, is sandy and benty downs. The soil is better toward the E., where it joins the Newtown loch and St. Quivox. The lower part next the village produces crops of rye, oats, and bear, which are good in wet seasons. The soil there is found good for crops of potatoes, and might produce turnip.³⁴

Ayrshire also contained coalfields which were described in three accounts (Newton, Kirkoswald and Stevenston) and mentioned in passing in others. Wodrow’s account of Stevenston is exceptional, both in the detail it contains on the development of the coal industry and in demonstrating his understanding of the geology of coal measures.³⁵ He included a sectional diagram illustrating the geology of the coal seams which is reproduced in figure 4 below. The diagram shows the seams of coal, around a mineshaft, giving their names, thickness, depth, approximate angle and direction of inclination.

³² Barr, County of Ayrshire, OSA, vol. XII, 1794, p. 84.

³³ Barr, pp. 85-89.

³⁴ Monkton and Prestwick, County of Ayrshire, OSA, vol. XII, 1794, p. 397-398.

³⁵ Stevenston, County of Ayrshire, OSA, vol. VII, 1793, pp. 1-40.

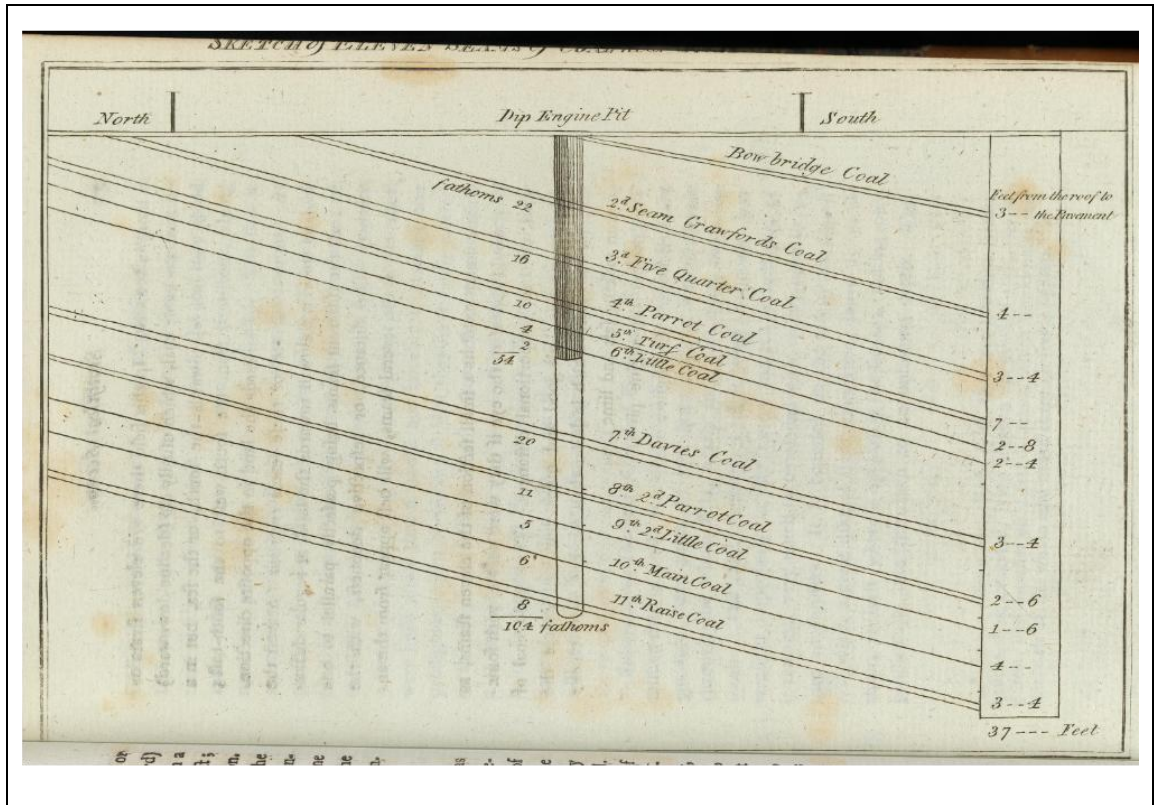


Figure 4: Sketch of Coal Seams near Saltcoats

While describing the coal industry with enthusiasm Wodrow, among others, was concerned about the unsettling effect of economic growth, the impact of immigration and the temptations new wealth created: 'The manner of life both of the sailors and miners, furnishes some temptation to drunkenness and intemperance.'³⁶

Improvement, particularly urban growth, came with its risks according to Wodrow.

In the absence of other information, it is difficult to explain why Auld Licht ministers in the sample wrote, on average, shorter accounts (eight pages) than New Licht ministers (twenty three pages). The average age of both groups was similar, so it appears unlikely that age or infirmity was a reason and Auld Licht ministers appeared to be equally supportive of improvement. It may be the case that they were less convinced of the need for such an exercise or saw it an imposition from a moderate dominated General Assembly but there is little in the accounts to throw light on this. In their interests and attitudes towards the natural environment and improvement the two factions appear very similar.

³⁶ Stevenston, County of Ayrshire, OSA, vol. VII, 1793, p. 35.

Parishes around Glasgow

The City of Glasgow and adjacent parishes are of interest for a number of reasons. Glasgow was at the centre of a commercial and industrial district, a port and a merchant community with transatlantic connections. The population of the city was not yet as large as that of Edinburgh, but it was growing rapidly and early in the nineteenth century would overtake Edinburgh.³⁷ Its role as a centre of colonial trade meant that its economic and environmental impact spread far beyond the immediate hinterland, particularly in the Americas. A study of Glasgow sugar merchants has examined the importance of chattel slavery in creating the city's wealth at the time of the statistical accounts. Money that was transforming the city and its hinterland, including the creation of new landed estates, originated, at least in part, in businesses dependent on slavery.³⁸

³⁷ In Webster's census of 1755 the population of Edinburgh was given as 30,922 and that of Glasgow 23,546. The first national census of the UK (1801) suggested that Glasgow had just pulled ahead with a population of 94,939 to Edinburgh's 93,112. For Webster's census see James Gray Kyd, *Scottish population statistics, including Webster's Analysis of population, 1755* (Edinburgh, 1952). The data from the 1801 census are available at *A Vision of Britain through Time* http://www.visionofbritain.org.uk/unit/10217751/cube/TOT_POP.

³⁸ For a recent analysis of the wealth generated from chattel slavery and how it sustained urban elites in Glasgow, see Stephen Mullen, *The Glasgow Sugar Aristocracy: Scotland and Caribbean Slavery, 1775–1838* (London, 2022).

Table 12: Environmental content of Glasgow accounts

Parish	Minister	Length of account		Environmental subject headings	
		Pages	Lines of text	Lines of text	%
Barony of Glasgow	John Burns	18	402	174	43%
Bothwell	Michael MacCulloch	39	1,107	476	42%
Cambuslang	James Meek	34	729	317	43%
Gorbals	William Anderson	5	118	34	28%
Govan	John Pollock	16	406	211	51%
Old or West Monkland	John Bower	16	399	198	49%
Rutherglen	David Ure	11	262	117	44%
Totals		139	3423	1527	44%
Averages		19	489	218	

The sample consists of seven accounts with an average length of nineteen pages. The longest account was for Bothwell (thirty nine pages and 1,107 lines) and the shortest for Gorbals (five pages and 118 lines). All were published between 1793 and 1795. For this sample the amount of text under environmental subject headings was 44% (1,527 lines out of 3,423). The account with most text under environmental subject headings was Bothwell (476 lines) and that with the least was Gorbals (thirty four lines) which was also the shortest account. The parishes with the highest proportion of text under environmental headings were Govan (51%) and Old or West Monkland (49%). The parish with the lowest proportion of text under environmental headings was Gorbals (28%) while all other parish accounts in the sample were between 42% and 44%.

Unfortunately, as with Edinburgh and Aberdeen, the account for the City of Glasgow is of uncertain authorship being compiled from ‘the communications of several respectable Inhabitants of that City’ who were not necessarily ministers.³⁹ For these reasons the parish account of the city has been excluded from the sample. The accounts of the nearby parishes compensate in part for this deficiency as they

³⁹ Glasgow, County of Lanark, OSA, vol. V, 1793, p. 488.

contain many details about the city and its role in promoting change and development. As elsewhere in Scotland the sample of accounts contained many details on the development of agriculture, but the proximity of the parishes to Glasgow, and ministers' response to the development of industry and its environmental impact is of particular interest.

Textiles, Dyeworks and Pollution

The textile industry was a major employer in the parishes around Glasgow, with spinning, weaving, bleaching and dyeing all mentioned. It has been estimated that by 1803 there were 50,000 employed in the cotton industry across Scotland, including men, women and children, and that this had become the largest sector of manufacturing employment in the country.⁴⁰ Glasgow was at the centre of the textile industry and its growth of the industry had created significant environmental impacts both in the demand for raw materials and in pollution it created.

For example, textile production increased the demand for dyestuffs. John Burns, minister at Barony gave a detailed account of the production of two dyes, cudbear and turkey red in the parish.⁴¹ The manufacturing process involved was complex and unpleasant, involving ammonia made from human urine. 3,000 gallons a day of urine was collected from the city, to produce a variety of coloured dyes including pink, red and blue. Turkey red was manufactured by David Dale at Dalmarnock in Barony, who extracted the dye from the root of the madder plant through a complex process involving the use of ashes, oil of vitriol (sulphuric acid), alum and ox blood. John Burns was enthusiastic about these developments but made no mention of the hazards associated with dye works or the associated pollution.

In England, in the manufacturing districts of Lancashire the pollution associated with textiles was already in evidence. John Aiken wrote an account of the textile industry in Lancashire noting that: 'The Irwell at Manchester and for some distance below is, however, destitute of fish, the water being poisoned by liquor flowing in from the dye-

⁴⁰ Norman Murray, 'A Social History of the Scottish Handloom Weavers 1790-1850,' unpublished PhD Thesis, University of Strathclyde (1976), p. 11.

⁴¹ Barony of Glasgow, County of Lanark, OSA, vol. XII, 1794, pp 112-116. The development of cudbear and turkey red dyes is described in Archibald Clow and Nan L. Clow, *The Chemical Revolution* (London, 1952), pp. 210-220.

houses.’⁴² This description of 1795 is contemporaneous with the OSA and it is surprising that none of the ministers mention any similar pollution around Glasgow. Dye works, cotton bleaching, iron works and coal are all mentioned, and all were potentially grossly polluting, yet the accounts make no mention of this. It may be that the effects of pollution near Glasgow were less noticeable, as the Clyde is a larger river with a greater flow of water than the Irwell and better able to absorb the effluent from industrial sites.

Even if the river Clyde was in a reasonably healthy state in the 1790s it must have been difficult to avoid noticing the impact of other new industries, including the smoke and slag from the Clyde Iron Works, the waste ‘bings’ and polluted water pumped out of coal mines by the newly installed steam engines, or the foul smells from the dyeworks. Yet the ministers mentioned none of it; rather they described their parishes in picturesque terms. For example, in Barony there were coal mines with twenty steam engines and at least three dyeworks; a cotton spinning mill; and bleaching, baking and brewing industries; but the minister still evoked its pastoral charms:

On the banks of Clyde, at Westthorn, and in many other places, the landscape is rich, various, and delightful. The river winding through richly cultivated fields, and frequently lost among the trees, which grow upon its banks; interspersed with many gentlemen's houses, and the large and populous city of Glasgow, with its numerous spires and venerable cathedral, present to the eye various striking views, and fill the mind with the pleasing ideas of industry, wealth, security, and happiness.⁴³

Nearby at Monkland to the east of the city there was a brick and tile works; a freestone quarry; bleachfields cotton works; the Clyde Iron Works at Tollcross with its blast furnaces and forges producing pig iron, bar iron and a boring mill for making cannon; and extensive coal mines with steam pumping engines together employing 435 miners. Yet the minister, John Bower, was likewise effusive about its beauty: ‘We have many extensive orchards, which some years turn out to great advantage. A

⁴² John Aikin, *A Description of the Country from Thirty to Forty Miles Round Manchester* (Manchester, 1795), p. 205.

⁴³ Barony of Glasgow, County of Lanark, OSA, vol. XII, 1794, p. 110.

stranger is struck with the view of this parish: It has the appearance of an immense garden.’⁴⁴

It is difficult to avoid the conclusion that these ministers sought to stress the happy and harmonious elements in the landscape. They were excited by modern technology and industry, but most did not report its environmental impact or see it as a threat to the beauties of the scenery.

The ‘Means of Improvement’

In understanding ministers’ attitudes towards the environment, the account of Bothwell by Michael MacCulloch is revealing. He included a section called ‘Means of Improvement’ which offers insights into his attitudes towards the natural environment.⁴⁵ MacCulloch argued that improvement begins with education in the virtues and principles of the Christian religion, included the study of Latin and the principles of Agriculture. He commended practical improvements including new hedge rows and enclosures, plantations, crop rotations, nineteen year leases and a ‘generous Indulgence upon the part of the Proprietor’ to tenant farmers to offset the cost of improvements.⁴⁶ He did not believe in offering any such indulgence to farm workers and urged farmers to moderate any wage rises.⁴⁷

MacCulloch’s description of the ‘Means of Improvement’ links Christianity, classical learning and agriculture. The mention of Latin as an agent of improvement suggests a yearning for a classical model, with landowners and gentleman farmers acting as modern ‘georgics’.⁴⁸ Following these principles would, he claimed, lead to better agriculture, enhance the rent of the landlords and improve the lot of the tenant farmers.⁴⁹ Improvement would make the landscape more picturesque, creating the

⁴⁴ Old or West Monkland, County of Lanark, OSA, vol. VII, 1793, p. 377.

⁴⁵ Bothwell, County of Lanark, OSA, vol. XVI, 1795, pp. 331-337.

⁴⁶ Bothwell, p. 336.

⁴⁷ Bothwell, p. 335.

⁴⁸ The self-conscious identification of agricultural improvement with models from classical antiquity, especially Virgil’s *Georgics*, has been explored in a number of studies, for example Charles W.J. Withers, ‘A Neglected Scottish Agriculturalist: The “Georgical Lectures” and Agricultural Writings of the Rev Dr John Walker (1731-1803)’, *Agricultural History Review*, vol. 33 (1985), pp. 132-146; Clare Bucknell, ‘The Mid-Eighteenth-Century Georgic and Agricultural Improvement’, *Journal for Eighteenth-Century Studies*, vol. 36 (2013), pp. 335-352; Laura M. Banducci ‘Cato the Elder and the “Theoretical Farmers” of 18th and 19th-century Britain’, *Classical World*, vol. 117 (2024), pp. 389-416. In stressing the use of Latin, MacCulloch may reflect the tradition of civic humanism in Scotland, see: David Allan, *Virtue, learning and the Scottish enlightenment* (Edinburgh, 1993).

⁴⁹ Bothwell, p. 336.

appearance of an extensive pleasure ground, with fertile and productive soil managed on the best scientific principles. This vision of improvement, which was developed over seven pages by MacCulloch, is often implicit in other accounts, particularly in those parts of rural Scotland where agricultural change had been most effective. Near the cities, or in the coalfields, where there had been rapid industrial development and social change, such a vision of an orderly society in a well-ordered environment was more difficult to sustain. This was particularly evident around Edinburgh, as described in the next section.

Parishes around Edinburgh

The City of Edinburgh was at the heart of the Scottish Enlightenment, so examining the parish accounts from ministers in and around the city can provide insights into attitudes towards the environment from ministers closest to the centre of enlightenment thinking. Unfortunately, as with Glasgow, this is complicated because of difficulties with source material. Of all the Edinburgh city parishes only one account (North Leith) was written by a minister. The accounts for the other City parishes (those mentioned are Edinburgh, Canongate, St. Cuthberts and South Leith) have no named ministers as authors, but do contain substantial contributions by William Creech, publisher of the OSA and an associate of Sinclair.⁵⁰ For these reasons the city parishes, with the exception of North Leith have been excluded from this sample. This sample therefore reveals the interests and attitudes of ministers around the city rather than those within the city.

⁵⁰ Sources mentioned in the account include William Maitland, *History of Edinburgh from Its Foundation to the Present Time* (Edinburgh, 1753); Hugo Arnot, *History of Edinburgh* (Edinburgh, 1779) and Webster's 1755 Census.

Table 13: Environmental content of Edinburgh accounts

Parish	Minister	Length of account		Environmental subject headings	
		Pages	Lines of text	Lines of text	%
Colinton	John Walker	13	373	128	34%
Corstorphine	James Oliver	19	505	177	35%
Duddingston	William Bennet	26	816	333	40%
Inveresk	Alexander Carlyle	49	1104	183	16%
Lasswade	John Paton	12	290	172	59%
Liberton	Thomas Whyte	4	98	21	21%
Newton	John Main	6	121	32	26%
North Leith	David Johnstone	7	176	29	16%
Ratho	James Robertson	9	222	96	43%
Totals		145	3,705	1,171	31%
Averages		16	411	130	

The nine accounts in the sample range in length from four to forty nine pages. The shortest account, that of Liberton, was abstracted by Sinclair from an earlier account of the parish by the minister, Thomas Whyte, who died in 1789. It has been included here as it reflects the views of the minister, even if it was written before Sinclair's inquiry commenced. The longest account is for Inveresk (Musselburgh) by Alexander Carlyle, a leading light in the Moderate party and Moderator of the General Assembly in 1770. The account with the greatest number of lines on environmental subjects (333 lines or approximately ten pages) was by William Bennet of Duddingston. A repeated theme in all these accounts is the relationship between the parishes and the city. This relationship had environmental significance as much of Edinburgh's waste was carted to surrounding parishes for use as a fertiliser but, for ministers, proximity to the city also had moral implications.

Ordure and Improvement

Unlike some of the accounts from near Glasgow, none of the ministers in the accounts in this sample praised the beauties of Edinburgh. They described the city as a market for local produce and a source of manure for local farms but were otherwise ambivalent. John Walker at Colinton noted the importance of the city's waste for farming in his parish. 'A great deal of land, though naturally unfit for wheat,

is, by the aid of the Edinburgh dung, employed in raising that grain.⁵¹ William Bennet at Duddingston noted the same. ‘The soils are naturally poor or indifferent. The great medium of improvement is the manure of Edinburgh; and the great object of ambition, is the multiplying of wheat crops.’⁵²

Urban manure may have included a mixture of street sweepings, animal waste and human waste. It is unlikely to have contained coal ash, which is toxic but which was produced in large amounts in the city. David Johnstone in North Leith tells us that coal was in universal use which accounts for Edinburgh’s reputation as ‘Auld Reekie’, a smoke-filled city.⁵³ A study of Nairn showed that a variety of urban wastes were applied to the soil in farms around the town and that this increased soil depth and enhanced its fertility.⁵⁴ Carters bringing urban waste to the parishes around Edinburgh may have carried out an odious trade but ministers were aware that this enhanced the crops in their parishes.

Agricultural improvement was well underway in the parishes around Edinburgh with some ministers playing an active part. Alexander Carlyle at Inveresk (Musselburgh) claimed some responsibility for introduction of two horse plough:

The writer of this account. and Dr Grieve, then minister of Dalkeith, having each of them entered into the possession of small farms in the higher parts of their respective parishes, in the year 1768 ... having observed the wheel plough with two horses, held and driven by one man, successfully used for some years within the park of Dalkeith, resolved to make trial of that method in their farms, though of a strong clay soil. They were laughed at in the beginning by the neighbouring farmers; but when the second year came round, and the luxuriance of their crops was observed, their example was immediately followed by all their neighbours.⁵⁵

Such a direct interest by a minister in farming and knowledge of the soils is not uncommon in the accounts and is explored in more detail in the section on soils in chapter six below.

⁵¹ Colinton, County of Edinburgh, OSA, vol. XIX, 1797, p. 584.

⁵² Duddingston, County of Edinburgh, OSA, vol. XVIII, 1796, pp. 364-365.

⁵³ Edinburgh, County of Edinburgh, OSA, vol. VI, 1793, pp. 570-576. James Hutton was a partner in a business converting chimney soot into sal ammoniac in Edinburgh, see Ray Perman, *James Hutton: The Genius of Time* (Edinburgh, 2022), pp. 59-60.

⁵⁴ Donald Davidson et al., ‘The legacy of past urban waste disposal on local soils’, *Journal of Archaeological Science*, vol. 33 (2006), pp. 778-783.

⁵⁵ Inveresk, County of Edinburgh, OSA, vol. XVI, 1795, pp. 12-13.

The Moral Superiority of the Rural Environment

A source of concern about the city which emerges from these ministers' accounts was political radicalism and its associations with the revolution in France. While this is primarily a political concern rather than environmental, it does shed light on ministers' preference for the rural rather than the urban environment. Many ministers regarded the countryside, where farming was the principal source of employment, as a healthier and better ordered environment than the city of Edinburgh. In a study of Scotland and the French Revolution, Harris suggested that from 1792 radical politics were in evidence in Edinburgh and other Scottish towns and cities and that the Dundas administration, alarmed by the threat of sedition, moved to shut down much of the activity.⁵⁶ Harris describes the Kirk as 'a willing bastion of loyalism' which supported government action with presbyteries and the General Assembly issuing loyal resolutions.⁵⁷ This is reflected in the accounts, in which ministers expressed concern about the risks associated with urban environment in contrast to the rural environment.

The most prominent example in this sample was James Oliver at Corstorphine, who wrote about the superiority of the rural environment: 'The employments in agriculture greatly conduce, not only to promote the health of the lower classes, but to preserve their morals from that degradation and corruption which is lamented in manufacturing towns.'⁵⁸ Of his parishioners he added: 'They are industrious in their occupations and, though in the neighbourhood of the capital, they discovered no foolish and vain desire to copy after its fashions; neither have they adopted its vices.'⁵⁹ In the city, he argued, the risks were greater: 'their politics too often degenerate into tumult and rebellion; their religion, if they even possess any, into idle disputation, discord, and schism.'⁶⁰ James Oliver may have been the most outspoken but he was not alone among the ministers in his concerns about the city Thomas Whyte at Liberton was worried about his parishioners, delivering in passing a crushing judgment on the capital. 'Their morals, in general, are not so unexceptionable as

⁵⁶ Bob Harris, *The Scottish People and the French Revolution* (London, 2008), pp. 115-145.

⁵⁷ Harris, *French Revolution*, p. 29.

⁵⁸ Corstorphine, County of Edinburgh, OSA, vol. XIV, 1795, p. 460.

⁵⁹ Corstorphine, p. 463.

⁶⁰ Corstorphine, p. 461.

could be wished; and no wonder, when they live in the neighbourhood of such a city as Edinburgh.’⁶¹ William Bennet echoed the same sentiment from Duddingston: ‘In truth, wherever men are collected together in considerable numbers, corruption is generated; and as there will probably be some amongst them found of depraved manners, the contagion is too apt to spread around.’⁶² William Bennet was a leading minister naturalist, and he too shared concerns about the moral depravity of the city. A more directly environmental concern, that was described by ministers in other parts of Scotland, was water quality. In some urban areas, particularly those with coal mines, water quality was poor. This was noted for example, by ministers in Paisley, Dunfermline and Campsie.⁶³ By contrast mineral water from country springs was seen as a pure and healthy source. In the parish of Campsie, James Lapslie contrasted the pure spring water available in the rural part of the parish with the poor quality of water near the coal mines.⁶⁴ Willaim Laing, the Episcopal minister at Peterhead, had written a pamphlet describing the benefits of mineral spring water, whose merits were also discussed in detail in the parish account by the minister, George Moir.⁶⁵

Some ministers added a picturesque description of the rural scenery of their parish, for example John Paton at Lasswade, on the river Esk:

The winding course of the river, appearing often to lose itself among the rocks; its banks, which are remarkably bold and finely wooded; the huge pieces of rock seen projecting at proper intervals from among the trees, form an assemblage of the most romantic and picturesque scenes that are to be met with in the southern parts of Scotland.⁶⁶

Other ministers in the sample who included picturesque descriptions in their accounts included John Walker at Colinton, James Oliver at Corstorphine, William Bennet at Duddingston, and James Robertson at Ratho. They praised the beauties of the countryside but offered no such praise for Edinburgh’s medieval architecture or

⁶¹ Liberton, County of Edinburgh, OSA, vol. VI, 1793, p. 509.

⁶² Duddingston, p. 383.

⁶³ Abbey of Paisley, County of Renfrew, OSA, Vol. VII, 1793, p. 76; Dunfermline, County of Fife, OSA, Vol. XIII, 1794, p. 478.

⁶⁴ Campsie, County of Stirling, OSA, Vol. XV, 1795, pp. 318, 320.

⁶⁵ See Matthew D. Eddy, ‘An adept in medicine: the Reverend Dr William Laing, nervous complaints and the commodification of spa water’, *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, vol. 39 (2008), pp. 1-13; Peterhead, County of Aberdeen, OSA, Vol. XVI, 1795, pp. 604-606.

⁶⁶ Lasswade, County of Edinburgh, OSA, vol. X, 1794, p. 284.

for the building of the neoclassical new town then underway. One minister wrote an outstanding description of the natural history of the parish. This was William Bennet at Duddingston who described the fossils, rock strata and botany of the parish, including a list of the aquatic plants of Duddingston loch. His account is described in more detail in chapter seven below.

The Merse (Lower Tweed Valley)

The whole of the parish is arable. The farms are all enclosed in the very best modern manner; and on many estates, the hedge rows, which are all in a thriving state, when seen at a distance by the traveller, exhibit the appearance of a highly cultivated garden. Of late years, great improvements have been made in agriculture, through the whole county of Berwick; but in no parish have they been carried on with greater rapidity, and to greater advantage, than in this.⁶⁷

The Merse of the county of Berwick, a low lying plain to the north of the Tweed immediately inland from Berwick upon Tweed offers insights into ministers' attitudes towards agricultural change. It was an area where 'improvement' had transformed the landscape and economy, developments that fill the parish accounts.

Table 14: Environmental content of Merse accounts

Parish	Minister	Length of account		Environmental subject headings	
		Pages	Lines of text	Lines of text	%
Chirnside	Walter Anderson	50	1106	723	65%
Coldstream	James Bell	11	309	67	21%
Eccles	Adam Murray	13	287	180	62%
Edrom	William Redpath	5	108	50	46%
Hutton	Adam Landells	6	150	64	42%
Ladykirk	Thomas Mill	5	118	100	84%
Swinton and Simprin	George Cupples	14	344	200	58%
Whitsom and Hilton	George Drummond	10	258	170	65%
Total		114	2680	1554	57%
Averages		14	335	194	

⁶⁷ Adam Murray, minister at Eccles, County of Berwick, OSA, vol. XI, 1794, p. 232.

The sample consists of eight accounts published between 1791 and 1795 and varying in length from five pages to fifty with an average length of 14 pages. The shortest accounts, both of five pages, were for Edrom and Ladykirk, with the account of Hutton only slightly longer at six pages. The longest account by far was that of Chirnside by Walter Anderson at fifty pages. The remaining four accounts were between ten and fourteen pages in length. The average proportion of text under environmental subject headings was 57% but there are striking variations between accounts. James Bell of Coldstream wrote the least about the environment (fifty lines or 21% of the total) and Walter Anderson at Chirnside the most (723 lines or 65% of the account). As a proportion of the whole, Thomas Mill allocated most space to environmental subjects with 84% of his short account being under environmental subject headings. Between these two extremes the remaining accounts contained between 42% and 65% of the accounts on subjects under environmental headings.

At 57% the average proportion of text under environmental headings in this sample is higher than both the Edinburgh sample (31%) and the Glasgow sample (44%) and roughly comparable with the Argyll islands (60%) or Argyll mainland (51%) samples. It is also higher than the Ayrshire samples both for the 'New Licht' (48%) and 'Auld Licht' (55%) ministers.

Agriculture was dominant in the lower Tweed valley. There was no coal locally and, other than Berwick, over the border in England, there were only a few small settlements. Compared to Argyll the lower Tweed valley has more subdued relief, a better climate and some of the best soils in Scotland.⁶⁸ Walter Anderson summarised the advantages of his parish at Chirnside. 'It commands, as most of them do, the view of a country, the richest in soil (with the exception of the Carse) of any in Scotland; and, we may add, in its present state of culture and fertility, not inferior to the best improved lands of England.'⁶⁹ These favourable circumstances were being exploited by a new generation of landowners and farmers using a variety of new techniques including enclosure, manuring with lime and marl, drainage, new types of plough and other technology, new varieties of crop and new breeds of

⁶⁸ The soils of the lower Tweed valley are predominantly brown forest soils of the Whitsome series with 'a high natural fertility'. See J. M. Ragg, *Soils of the County round Kelso and Lauder* (Edinburgh, 1960), p. 98.

⁶⁹ Chirnside, County of Berwick, OSA, vol. XIV, 1795, pp. 4-5.

animals, all of which are described in the accounts. Of all the sample areas, the lower Tweed valley exhibits agricultural change at its most dramatic with implications for both the economy and the environment. The accounts provide many details of these changes, offering a rich source of information about ministers' interest in agriculture, and their perceptions of its environmental and social consequences. Examples of ministers' discussion of agricultural change and its consequences are given in the sections below.

A Land Transformed

In his account of agricultural change in Scotland Tom Devine makes the point that landscapes across lowland Scotland were transformed by developments in agriculture.⁷⁰ In just a few decades open fields and fermtouns were replaced by new farm buildings, fields enclosed by hedges, ditches or stone dykes, and woodland plantations.⁷¹

Ministers were particularly aware of the importance of soils in these changes. They noted the contrast between heavy clay soils on the low-lying land, suitable for wheat, and lighter sandy soils on higher ground, that were better for turnips, and they understood the importance of new manures, marl and lime. The extensive use of marl and lime now allowed farmers to apply inorganic manure to all their land, rendering the old infield outfield division redundant.⁷² The impact on soil fertility and productivity was noted by William Redpath at Edrom, who wrote that one farmer had marled the whole of his land and enclosed it with stone dykes, subsequently seeing the rent rise from £500 to £1200 or more per annum.⁷³ Marl was available locally in some of the parishes, for example around the river Blackadder, but lime had to be brought by cart from Berwick. From Eccles it was 14 miles to the nearest source of

⁷⁰ T.M. Devine, *The Transformation of Rural Scotland: Social Change and the Agrarian Economy 1660-1815* (Edinburgh, 1994), pp. 50-53.

⁷¹ *Landscape Character Assessment Review: Borders Landscape Evolution and Influences* (2019), pp. 25-27, <https://www.nature.scot/doc/landscape-character-assessment-borders-landscape-evolution-and-influences>.

⁷² Robert A. Dodgshon, 'Land improvement in Scottish farming: marl and lime in Roxburghshire and Berwickshire in the eighteenth century', *The Agricultural History Review* vol. 26 (1978), pp. 1-14.

⁷³ Edrom, County of Berwick, OSA, vol. I, 1791, pp. 118-119.

lime but, as Adam Murray noted, in summer the carts and horses of almost every farmer collected and delivered lime to the fields, six days a week.⁷⁴

The ministers also provided details of new crop varieties, breeds of sheep, and new agricultural technology. Thomas Mill at Ladykirk noted how the traditional breed of sheep known as ‘muggs’ had been replaced by the Leicestershire breed.⁷⁵ New technology was introduced by James Small (1740-1793), born in Chirnside and mentioned in the account by William Redpath. Small’s lightweight plough was designed at his workshop in Edrom and subsequently adopted widely across Scotland.⁷⁶

Environmental Impacts of ‘Improvement’

The accounts make relatively few comments on the environmental impact of agricultural change. James Bell at Coldstream mentioned in passing the lack of botanical interest in the lower Tweed valley compared to other parts of Scotland.⁷⁷ Ministers in the Merse wrote less about flora and fauna than those in Argyll, compared to which here was little ancient woodland in the Merse, and few wetlands. Other sources confirm the lack of woodland in Berwickshire, for example the *General View of the Agriculture of Berwick Shire*. This contained an estimate that, out of a total 270,000 acres of land in the county, there were only about 200 acres of natural woodland ‘mostly dwarfy and not thriving’.⁷⁸ The *General View* blamed the poor condition of the woodlands mainly on grazing in the woodlands by sheep. It also noted that gentlemen had been embellishing their estates with new plantations, totalling about 3,500 acres.⁷⁹ The Survey of Roxburghshire, written by the minister David Ure, made a similar observation for a neighbouring county.⁸⁰ Samuel Johnson, who entered Scotland at Berwick on his way to the Hebrides famously commented on the lack of trees. He observed that: ‘From the bank of the Tweed to St. Andrews I had

⁷⁴ Eccles, p. 232.

⁷⁵ Ladykirk, County of Berwick, OSA, vol. VIII, 1793, pp. 72-73.

⁷⁶ Edrom, p. 118.

⁷⁷ Coldstream, County of Berwick, OSA, vol. IV, 1792, p. 415.

⁷⁸ Alexander Lowe *General View of the Agriculture of Berwick Shire: With Observations on the Means of Its Improvement* (Edinburgh, 1794) p. 56.

⁷⁹ Lowe, *General View of Berwickshire*, p. 57.

⁸⁰ David Ure *General View of the Agriculture of the County of Roxburgh: With Observations on the Means of Its Improvement* (Edinburgh, 1794) p. 69.

never seen a single tree, which I did not believe to have grown up far within the present century'. For Berwickshire at least, he may not have been exaggerating.⁸¹

There was one exception to the lack of biodiversity in the lower Tweed valley, and that was the river itself. Thomas Mill at Ladykirk noted that the Tweed had an abundance of salmon, trout and eels. Waterfowl included goosanders, wigeons, and cormorants 'and sometimes grebes, and speckled divers'.⁸² The river had neither been improved nor badly polluted and remained rich in aquatic life.

Ministers' Response to Commercial Farming

While the picturesque was fashionable, Tom Devine has stressed that the principal motive for agricultural improvement was financial gain:

Many lowland landowners began to spend massive sums on estate infrastructures, not because they saw 'improvement' as a fashionable hobby, but because they now expected a very handsome profit on their investments within a relatively short time-scale by gearing outlay to rent increase.⁸³

Ministers in the Merse noted the rapid growth in the rental value of farms in their parishes, with rents doubling or increasing threefold as farms became available for lease in the 1790s. Adam Murray in Eccles picked up gossip about increasing values: 'There is a farm, near Eccles, that expires in a year or two, rented at £180, and it is credibly reported, that £480 has been offered, and refused.'⁸⁴

Ministers also noted that the population was increasing in their parishes, with better housing and improvements in food and health. 'Improvement', as it is described in the Merse, appeared to offer a better life for all. New technology was making ploughing and threshing more efficient, and crops and produce were readily sold to growing urban markets in Scotland or England through the ports of Eyemouth or Berwick. There were some reservations about the changes, for example when Adam Murray wrote about the lack of small farms available for rent in Eccles or when George Cupples noted the passing of the 'gude men', and their replacement by a new generation of commercially minded farmers. Otherwise, there is little evidence of nostalgia in the accounts either for the old system of agriculture with its open fields or

⁸¹ Robert Walker, 'Johnson and the Trees of Scotland', *Philological Quarterly*, vol. 61 (1982), pp. 98-101.

⁸² Ladykirk, p.74.

⁸³ Devine, *The Transformation of Rural Scotland*, pp. 45-50, quotation at p. 45.

⁸⁴ Eccles, p. 238.

the old way of life it supported. This lack of nostalgia contrasts with some popular contemporary literary depictions of rural life. For example, Robert Burns in 'The Cottar's Saturday Night', first published in 1786, presented an idealised version of rural life which became an icon of Scottish romantic nationalism.⁸⁵ Ministers in this sample, however, largely approved of the new, well-ordered world of landowners, tenant farmers, tradesmen and farm workers who, in Berwickshire, were well away from the corrupting influence of cities and industries. They were proud of the social and environmental impacts of agricultural change and happy to offer their support to the landowners and tenant farmers driving the changes.

Improvement and Enlightenment

The descriptions of improvement by ministers in the Merse highlight the relationship between enlightenment and agricultural improvement. Despite being at a safe distance from Edinburgh, there were connections between the Merse and the *literati* of Edinburgh. Henry Home, ennobled as Lord Kames (1696-1782), was born in the parish of Eccles. While he gained fame as an Edinburgh advocate, judge and historian he retained an interest in agriculture, publishing *The Gentleman Farmer* in 1776.⁸⁶ In retirement he took on the transformation of the estate he had inherited at Blair Drummond near Stirling, draining the waterlogged carse to create new farmland. James Hutton (1726-1797) was resident at the family farm at Slighouses in the Berwickshire parish of Bunkle and Preston for the decade before 1768, where he experimented with new agricultural techniques. His record of this work was written up in an unpublished treatise.⁸⁷ For Hutton, enlightenment philosophy and farming were closely linked. In the treatise he set out his intention to make: 'philosophers of husbandmen and husbandmen of philosophers by which a nation is made both powerful and happy.'⁸⁸ David Hume (1711-1776) was brought up at Ninewells in the parish of Chirnside. He was not directly involved in managing the family estate, which

⁸⁵ Sarah Sharp, 'Exporting 'The Cotter's Saturday Night': Robert Burns, Scottish Romantic Nationalism and Colonial Settler Identity', *Romanticism*, vol. 25 (2019), pp. 81-89.

⁸⁶ Henry Home, Lord Kames, *The Gentleman farmer, being an attempt to improve agriculture by subjecting it to the test of rational principles* (Edinburgh, 1776).

⁸⁷ Charles W.J. Withers, 'On Georgics and Geology: James Hutton's "Elements of Agriculture" and Agricultural Science in Eighteenth-Century Scotland', *Agricultural History Review*, vol. 42 (1994), pp. 38-48.

⁸⁸ Quotation from the unpublished MS Treatise on Agriculture: <https://james-hutton.org/james-hutton/the-farmer/>. I am indebted to Alan Werritty for the quotation.

was run by his brother John, who was noted in the parish account as an active improver. These examples offer a reminder of the connections between agriculture and enlightenment and how some of the ‘literati’ of the Scottish Enlightenment had their roots in the Berwickshire soil. Ministers were observers and participants in both these worlds, educated at Edinburgh and other enlightenment universities and bringing their university learning to parishes across Scotland.

Conclusion to Chapter Five

These samples demonstrate that the natural environment was of interest to ministers across Scotland. Environmental subjects are mentioned in all the accounts and in some they form the majority of the text. The accounts from rural Scotland on average contained a higher proportion on environmental subjects than those from urban Scotland. The environmental subjects covered in the accounts include descriptions of the physical environment, of flora and fauna, and of how the natural environment was shaped or exploited by agriculture and industry. The depth of knowledge of many ministers about the environment is impressive and reveals a keen interest in the environment of their parishes.

Ministers were strong advocates of improvement, irrespective of location. In Ayrshire, agricultural improvement was supported by ministers of different parties within the Church. Some ministers were reticent about some of the social consequences, particularly in urban areas, and the accounts strongly suggest that they felt most comfortable in a well-ordered rural environment reflecting an orderly society.

Ministers’ enthusiasm was such that few saw negative environmental consequences of change.⁸⁹ Rather, they wrote about how landscapes were made more beautiful by new developments, even in areas of rapid industrial development. In these descriptions some ministers adopted the fashionable language of the picturesque.

The next two chapters look in greater depth at environmental subjects, exploring what ministers across Scotland were writing on flora, fauna and the physical environment. This offers the opportunity to search for evidence about their views on a wide range of

⁸⁹ A few ministers who were sensitive to industrial or agricultural pollution are identified in chapter six below.

subjects, including the history of the earth, views that may help us understand their passive response to Hutton's *Theory*.

Chapter Six: Flora and Fauna

This chapter explores ministers' descriptions of flora and fauna in the OSA. It identifies environmental subjects that were of interest to ministers and considers their attitudes towards different species and habitats. As noted in chapter three, most ministers had been introduced to natural philosophy or natural history or both as part of the arts curriculum at the outset of their university education. This may have encouraged them to provide the detailed descriptions of flora and fauna found in many accounts. They were also educated in theology but there is little or no mention of theology in the descriptions, which are descriptive and secular in character.

The approach adopted in this chapter and chapter seven is original: it offers a systematic examination of ministers' descriptions of flora and fauna, initially by identifying keywords relating to flora and fauna, and then by investigating in more depth examples of descriptions of trees, woods, and flowers, birds and fish. This discussion does not include ministers' observations about domesticated or farm animals but does discuss those animals considered a nuisance (vermin). There are many hundreds of references to flora and fauna in the OSA, and to manage the range and diversity of accounts, this chapter begins by presenting the results of a search on relevant keywords, in order to assess the relative importance of different flora and fauna in the accounts.

Keywords

The approach adopted to summarise such a large and complex subject was to count the number of accounts (sometimes in the hundreds) that mention specific terms relating to the natural environment. This approach is possible using the search function of the Edina Statistical Account website which contains facsimile copies of all the old and new accounts, along with their transcripts.¹ The accounts are arranged by county, and the website offers a simple keyword search function that makes it possible to search for accounts by county, by name of parish, minister or by

¹ The Statistical Accounts of Scotland website, with details of its search function can be found at: <https://stataccscot.edina.ac.uk/static/statacc/dist/home>.

other keywords. Searching by keyword is powerful tool but must be used with caution. For example, a search on the term 'elder' produces more references to kirk session elders than to the flowering shrub. Variable spelling can also make searching unreliable, for example 'kittywake' also appears in the accounts as 'kittiewake' or 'kettywake'. Accounts from the northern isles and *Gaeltachd* sometimes describe species in words or spellings derived from Norn or Gaelic. These issues are discussed in the text as they arise. Given the large number of accounts mentioning some species of flora and fauna, the discussion is selective and indicative, rather than comprehensive. Birds, for example, are given more space in this chapter than flowers as they appear more often in the accounts and because ministers descriptions of birds offer many insights into ministers' interests and understanding of the natural world.

The table of flora and fauna below introduces this approach, identifying some generic terms used to describe fauna and flora. The search results give the number of accounts that include mention of keywords on flora and fauna, not the total number of times the word appears in the accounts, a figure that would be far higher. There are 938 accounts in the OSA and the word 'trees' for example, is mentioned in 496 accounts (52% of all accounts) whereas the word 'botany' appears in only eight (less than 1% of all accounts).² In the tables in this and the next chapter the percentage (given in brackets) always refers to the proportion of all 938 accounts.³

² The Edina website does not calculate percentages; these must be derived by the website user.

³ Unless otherwise indicated, all the examples given in the following chapters were written by ministers. However, as discussed in chapter five, the complete set of 938 accounts includes a small proportion (about 5%) by contributors other than ministers. It was not possible to extract these contributions using the search function on the Edina website: the figures and percentages given in the tables represent a search over all 938 accounts, including those not authored by ministers.

Table 15: Flora and fauna

Keywords	Number of accounts	Notes
Animals	429 (45%)	Includes all references to the term ‘animal’ and ‘animals’ in the accounts but does not include references to individual species.
Birds	229 (24%)	Includes all references to ‘bird’ or ‘birds’, but not individual species.
Botany	8 (<1%)	Two of the references are to university accounts (Glasgow and Aberdeen), one is to ‘Botany Bay’ in the parish of Culross.
Fauna	0	The earliest record of ‘Fauna’ in English was by Gilbert White in 1771 but the term did not enter widespread use until the nineteenth century. ⁴
Fish	423 (45%)	Excludes ‘fishing’. Including ‘fishing’ raises the number of accounts to 504(53%).
Flora	8 (<1%)	Five of the references relate to John Lightfoot’s <i>Flora Scotica</i> .
Heath	429 (45%)	A generic term describing a wide range of habitats including lowland heath, moorland or peat bogs and occasionally used to mean a fuel (including peat and broom).
Natural history	41 (4%)	Includes references to its teaching in universities and to Pliny’s Natural History. ⁵
Natural philosophy	11 (1%)	Six of the references are to the study of natural philosophy in the universities.
Trees	496 (52%)	Many accounts making multiple references to trees in the parish, including plantation trees.
Woods	572 (60%)	Multiple references in many accounts to woods, woodlands, their planting and management.

This overview identifies some generic terms that were mentioned frequently in the OSA with, for example, the terms ‘woods’, ‘trees’, and ‘fish’ mentioned in over half the accounts. It makes clear that modern scientific terms were mentioned only sparingly in the OSA. Fauna does not appear at all and flora in only eight accounts. Five of the eight matches to the word ‘flora’ relate to *Flora Scotica*, the first systematic guide to the flora of Scotland, by the English botanist (and Anglican clergyman) John Lightfoot,

⁴ OED entry for ‘fauna’.

⁵ Pliny the Elder (AD 23–79) compiled 37 volumes published as *Naturalis Historia* subsequently translated into English from the seventeenth century. See John Healy, *Pliny the Elder: Natural history-A Selection* (London, 2004).

published in 1777.⁶ *Flora Scotica* was compiled in part from field work carried out by Lightfoot when he accompanied Thomas Pennant and John Stuart (later to be minister at Luss and author of the account of the parish) on a tour of Scotland in 1772. Botany is also mentioned sparingly with only eight mentions, including the university accounts for Glasgow and Aberdeen that refer to the teaching of botany. Natural history is mentioned in forty one accounts. These figures reflect the evidence set out in the literature review that suggest that the modern usage of terms such as ‘botany’ and ‘zoology’ did not generally replace the traditional categories of natural history and natural philosophy until the nineteenth century.

Flora

While there are only a small number of references to ‘flora’ or ‘botany’ in the parish accounts, they are worth noting, as they suggest that a number of ministers held a particular interest in the subject, possibly acquired in the course of their university education. For example, David Dow (1757-1827), minister at Cathcart near Glasgow was enthused by botanical study:

The banks of the Cart, have long been resorted to, by the botanical student. Such is the warmth and shelter, in some of these sequestered spots, that almost a perpetual verdure is to be found. Here, specimens of most of those plants, which the clearing the grounds of the woods, with which they were originally covered, have banished from the country, still shoot up in their native luxuriancy and vigour.⁷

Dow was unusual, possibly unique in the accounts, in expressing concern at the loss of species. Many more ministers who described species with interest but not in terms of nature conservation. An example was William Walker, minister at St. Cyrus in the county of Kincardine who included a list of thirty four species of plants of which an extract is included in the figure below. The account notes that the list was prepared for the minister by James Beattie junior, of Marischal College, Aberdeen. Walker was sufficiently confident of his knowledge of botany to criticise Lightfoot on the omission of one species he knew to be native to Scotland. Walker also included a detailed description of the minerals of the parish, which is discussed in the next chapter.

⁶ John Lightfoot, *Flora Scotica: or, a Systematic Arrangement, in the Linnæan Method, of the Native Plants of Scotland and the Hebrides* (London, 1777).

⁷ Cathcart, County of Renfrew, OSA, vol. V, 1793, p. 347.

Plants and Herbs.—Whilst the mineralogist would find pleasure in examining the rocks, the botanist might also be entertained with the herbs and plants, which are to be found either in the Heughs of St. Cyrus, or on the adjoining shore. Professor BEATTIE, *junior*, of the Marechal College, Aberdeen, who has made botany a good deal his study, favoured the writer of this article with the following list of them :

1. Valeriana officinalis,	-	Great wild valerian.
2. Phleum pratense,	-	Cat's tail grafs.
3. Phleum nodosum,	-	Another species of cat's tail grafs.
4. Festuca sylvatica,	-	Wood fescue grafs.
5. Bromus sterilis,	-	Barren brome grafs.
6. Avena fatua,	-	Bearded oat grafs.
7. Arundo arenaria,	-	Sea reed grafs. (Bent, Scots).
8. Elymus aromarius *,	-	Sea lime grafs.
9. Scabeola arvenensis,	-	Corn scabius.
10. Campanula glomerata,	-	Lesser Canterbury bells.
11. Pulmonaria maritima,	-	Sea buglofs.
12. Allium vineale,	-	Crow garlic.
13. Rumex maritimus,	-	Sea dock.
14. Epilobium angustifolium,	-	Rose bay-willow herb.
15. Epilobium hirsutum,	-	Hoary willow herb.
16. Silene amœna, Sp. pl. †,	-	Sea campion of Linnæus.
		17. Anterrium

* Mr. LIGHTFOOT, in his appendix to the *Flora Scotica*, excludes this from the list of native plants: It is undoubtedly, however, a native of Scotland.

Figure 5; Extract from the parish account of St. Cyrus ⁸

The list and classification of species prepared by James Beattie for Walker's account includes names in English and in Latin using the Linnaean system reflecting the tradition of empirical natural history taught in Scottish universities. Beattie's father had been the first Professor of Civil and Natural History at Marischal College where students, including Walker, were introduced to the study of natural history and natural philosophy.⁹ This supports the view that the teaching of natural history in Scottish universities is important in explaining why ministers were interested in the natural environment.

⁸ St Cyrus, County of Kincardine, OSA, vol. XI, 1794, p. 101.

⁹ Paul B. Wood, *The Aberdeen Enlightenment: The Arts Curriculum in the Eighteenth Century* (Aberdeen, 1993), p. 99.

Trees and Woods

Woodlands were of interest to ministers for several reasons. Richard Oram has argued that the planting and management of woodlands was the first great achievement of agricultural improvement in Scotland and the descriptions by ministers articulate their enthusiasm for this development.¹⁰ Both the utility and, in some cases, the beauty of woodlands are mentioned.

The terms ‘trees’ and ‘woods’ produce many matches in the accounts. Several species of tree were mentioned frequently, as set out in table 16.

Table 16: Trees

Keyword	Number of accounts	Notes
Alder/Aller	91 (9%)	Both spellings are found in the accounts. ‘Alder’ produces 69 matches while for ‘Aller’ it is 22.
Birch	174 (18%)	
Fir	305 (32%)	Includes ‘Scotch Fir’ which may refer to Scots pine but also other including silver fir and pitch fir.
Hazel/Hazle	7648 (8%)	Includes 48 matches for ‘Hazel’ and 28 matches for ‘Hazle’.
Holly	15 (1%)	
Larch/Larix	111 (11%)	Widely mentioned as a plantation tree, with ‘Larch’ having 44 matches and ‘Larix’ 67.
Oak	254 (27%)	
Pine	54 (5%)	Generally refers to the native Scot pine but occasional references to New England or Weymouth pines.
Plane	88 (9%)	In most case probably refers to the sycamore (<i>Acer pseudoplatanus</i>).
Poplar	15 (2%)	

Other trees mentioned in the accounts include lime, horse chestnut, walnut, mountain ash, and laburnum. Caution is necessary in interpreting the results with some terms being excluded (ash, beech and willow) because of confusion with other meanings. Inconsistency in the naming of species is also an issue, with alder, and hazel appearing with alternative spellings or names.

¹⁰ Richard D. Oram, *Where men no more may reap or sow: the Little Ice Age: Scotland 1400–1850* (Edinburgh, 2024), esp. chap. 7, ‘Improvement’s First and Greatest Child: Woodland and Plantation 1700–1790’.

Descriptions of woods come from all parts of the country. From Kilmalie, in Lochaber, Alexander Fraser, reported on natural woods and plantations: 'The trees, that grow naturally, are oak, fir, birch, ash, mountain-ash, holly, elm, wild geen, hazle, and the Scotch poplar. Those planted are, larix, spruce, silver fir, beech, plane, and fruit trees.'¹¹ At Monymusk in the county of Aberdeen the minister noted that, out of the total area of the parish (9,337 acres) there were 1,881 acres of woodland. This included the plantation of Archibald Grant 'who had the pleasure of seeing the trees arrive at maturity, and of deriving annually a considerable revenue from the sale of wood.'¹² To the south in Canonbie near Dumfries, John Russel described healthy woodland, both natural and planted:

This parish abounds in woods. The number of acres thus occupied cannot be less than 1000. The oak reigns here over his subjects of the wood, of all denominations, from the creeping ivy to the tallest ash. In the new plantations, plains, beeches, elms, firs of every description, poplars, etc. are making rapid progress, being properly fenced, and seasonably pruned.¹³

In other parts of the country, accounts suggest there was less woodland. At Longside in Buchan, William Greig bemoaned the lack of trees:

The want of woods and shelter in this corner of Aberdeenshire, is one of the circumstances which seems to operate most powerfully to its disadvantage, in the opinion of our southern neighbours. Such extensive tracts of country as those of Cruden, Longside, Peterhead, etc. without either trees or hedges to diversify the landscape, are, to be sure, not very gratifying to the eye.¹⁴

The lack of woodland is a theme repeated in other parish accounts from the northeast, including Auchterless by Alexander Rose, Belhevie by Alexander Forsyth, Ellon by James Miln, and Strathdon by John Gordon. Also in the county of Aberdeen, at Rathen, William Cumine noted the lack of woodland but that there was evidence of its former existence: 'No natural wood grows here; but the mosses abound with oaks of a large size; some in such a state of preservation as to be fit for many useful purposes.'¹⁵

¹¹ Kilmalie, County of Inverness, OSA, vol. VIII, 1793, p. 423.

¹² Monymusk, County of Aberdeen, OSA, vol. III, 1792, p. 76.

¹³ Canonbie, County of Dumfries, OSA, vol. XIV, 1795, p. 409.

¹⁴ Longside, County of Aberdeen, OSA, vol. XV, 1795, p. 291.

¹⁵ Rathen, County of Aberdeen, OSA, vol. VI, 1793, p. 20.

To the south, at Coldstream in the agriculturally productive lower Tweed valley, the minister, James Bell, also bemoaned the lack of woodland: 'There are no natural woods, forests, waste or common grounds. Near Tweed on this side, and still more remarkably on the opposite bank, as far as the Chiviot, and the ranges of hill contiguous to it, the want of trees attests the border desolations.'¹⁶ The meaning of 'border desolations' is not made clear and whether it relates to the lawlessness in the border counties preceding the Union of the Crowns of 1603 or possibly the legacy of the Cromwellian invasion of 1650.

Many accounts described new woodland planting by 'improving' landowners with 381 accounts mentioning 'plantation'. The account of Dunkeld by John Robertson included a detailed description of the woods of the parish, ancient and modern, and their management:

The plantations will soon become a more important object than the natural woods. Within 25 years past the Duke of Atholl has planted 1000 acres in this parish, upon the heights round little Dunkeld and Invar, not only with Scotch fir, but with a great proportion (probably more than one half) of larix; together with many thousands of oak, ash, elm, plane, beech and other species; all exceeding 3 millions of trees.¹⁷

In one parish in Lanarkshire (Avendale and Strathaven) John Scott urged woodland planting for its beauty and utility:

Shelter is also much wanted here. The Duke of Hamilton's estate in the parish consists of upwards of 11,400 acres: Were two or three hundred of these laid out in belts of plantation, as has been done in the parish of Hamilton it would both beautify the scenery and mend the climate.¹⁸

By mending the climate Scott was probably referring to shelter belts reducing exposure to wind and frost damage. This and other benefits of planting were explained by James Williamson, 'junior of Whitekirk', in the county of Haddington.

The trees planted in the links are the Scotch fir; in Binning wood there is a great variety, viz. oak, ash, beech, elm, plain, fir, willows, and several others; the thinnings of which have, for many years past, yielded a considerable income, often above 500 L. a-year; and, besides the advantage that is derived from the shelter which the plantations afford, the grass in the woods is much more valuable than it would have been, if allowed to remain in its original state.¹⁹

¹⁶ Coldstream, County of Berwick, OSA, vol. IV, 1792, p. 415.

¹⁷ Little Dunkeld, County of Perth, OSA, vol. VI, 1793, p. 359-360.

¹⁸ Avondale, County of Lanark, OSA, Vol. IX, 1793, p. 398.

¹⁹ Whitekirk and Tynninghame, County of Haddington, OSA, Vol. XVII, 1796, p. 398.

In the far north successful planting was more challenging, as described at Canisbay in Caithness by John Morison.

There is no planting in the parish. A good many years ago, an experiment was made on a part of the Warth Hill. A few acres were planted with firs. They throve very well while young; but the fence being insufficient, and soon mouldering away, and the plantation exposed to all possible injury, the whole perished, and at present no vestige of it is to be seen.²⁰

The minister on Gigha spoke for many in the islands of the west: 'Another inconvenience here, in common with all the Western Isles of Scotland, is the want of wood.' Of interest he noted that that the island had not always been devoid of wood: 'it seems to have been once well stocked with trees. Several oak trunks are dug up in the mosses'.²¹

Where there were natural woodlands, they were often worked for profit, as at Dunkeld:

The natural woods, which make no trifling part of the wealth of the parish, consist mostly of oak; and grow in smaller and larger clumps along the banks of the Tay, all except one wood in the east end of Strathbran. The grounds that produce them, are for the most part of very poor quality, so steep as to be inaccessible to the plough, and incapable of cultivation. These woods are treated in the way of coppice, being commonly sold to wood cutters, and felled when from 20 to 25 years old.²²

At Rothiemay in Banff, James Simmie described how woodland was managed for income:

Plantations and natural woods occupy a considerable part of this parish. They consist chiefly of fir, birch, ash, elm, and aller, which, in consequence of the scarcity of these in most of the neighbouring parishes, are sold at high prices, and bring the proprietors from £100 to £200 a year. And it may be presumed, that, some years hence, they will bring much more....²³

In similar terms, in the Lanarkshire parish of Carmichael, Robert Inglis described woodland management by the Earl of Hyndford: 'There are at Carmichael 1200 acres enclosed and subdivided by him. The enclosing and planting was begun about the year 1738, and mostly completed in the 1762... the weedings here, and at Westraw, yield near £200 annually.'²⁴ The utility and beauty of woodland planting were twin

²⁰ Canisbay, County of Caithness, OSA, Vol. VIII, 1793.

²¹ Gigha and Cara, County of Argyll, OSA, Vol. VIII, 1793, p. 45.

²² Little Dunkeld, County of Perth, OSA, Vol. VI, 1793, pp. 359.

²³ Rothiemay, County of Banff, OSA, Vol. XIX, 1797, p. 387.

²⁴ Carmichael, County of Lanark, OSA, Vol. XIII, 1794, p. 366.

themes in the accounts. Hugh Meiklejohn approved of the plantations in in his parish of Abercorn in the county of Linlithgow:

The natural beauty of the parish is greatly heightened by the quantity of land which is planted, and the taste with which it has been done. Continued plantations, from the vicinity of Queensferry to Blackness, mark the bounds of the parish, and exhibit a scene rich and beautiful.²⁵

At Urquhart, William Gordon praised the work of the landowner, the Earl of Fife ‘whose plantations are executed with uncommon taste and judgement, and add much to the beauty and ornament of the country.’²⁶ At Aberdalgie in Perth William Garvie also reported that the plantations ‘are exceedingly valuable, and add greatly to the beauty of this part of the country.’²⁷ In both cases beauty and improvement appear to be linked in the mind of the ministers. While later romantic writers of the nineteenth century would celebrate the natural beauty of the wet and the wild, ministers describing woodland in the 1790s preferred a well ordered landscape improved by human activity.

The number of accounts that mention woodlands, or their absence clearly reflects the interest of ministers and others in the subject. The association of profit and beauty resulting from planting by landowners is a theme that is repeated many times in the accounts. Across the country landowners were establishing plantations for several reasons: to improve productivity, to sell timber and generate income; to provide shelter, and to beautify the landscape. Along with field enclosures and new agricultural practices ministers understood that this was part of the package of measures contributing to ‘improvement’ and were supportive of the changes.

Evidence of Former Forests

Of particular interest is the awareness of environmental change in the accounts where ministers noted the presence of old tree stumps and roots in peat bogs. For some ministers these were simply a source of useful fuel in a landscape where wood was scarce. (as for William Cumine at Rathen noted above) but for others such remnants suggested the earlier existence of extensive areas of woodland that had now disappeared. The idea that a great wood might once have covered the land has

²⁵ Abercorn, County of Linlithgow, OSA, Vol. XX, 1798, p. 388.

²⁶ Urquhart, County of Elgin, OSA, Vol. XV, 1795, p. 97.

²⁷ Aberdalgie, County of Perth, OSA, Vol. XVIII, 1796, p. 152.

been reviewed critically by environmental historians including Christopher Smout and Richard Oram. They have argued convincingly that the ‘Forest of Caledon’ is a myth unsupported by either historical or ecological evidence.²⁸ However it is clear from the accounts that, in the 1790s, many ministers were aware of the idea of a great wood and saw evidence for it in their parishes. Charles McHardy, minister of the United Parishes of Crathy and Braemar suggested that the forest of Marr had been ‘part of the great northern Caledonian forest’:

In the deepest mosses or morasses, within the immense range of extensive forests above mentioned, there are to be found large logs, or roots of wood (even where there is not a tree now to be seen standing), which affords the most incontrovertible evidence, that they have formerly been over-run with timber.²⁹

The idea of the great forest of Caledonia was far from new. The earliest written record is from Pliny the Elder who referred to it as the *Silva Caledonia*.³⁰ The history of Scottish woodlands is a complex subject that is being rewritten as new evidence from pollen analysis and other sources becomes available, but the accounts suggest that many ministers believed that the area of woodland in Scotland had been much more extensive in earlier centuries. The main evidence lay in the peatbogs of both upland and lowland Scotland.

In Yarrow, in the county of Selkirk, Robert Russell lamented the present lack of woodland and compared it to the past:

This parish formerly abounded with wood, insomuch that it received the designation still belonging to it, of Etterick Forest. But the name is now egregiously misapplied, as every remnant of the old wood hath entirely disappeared. From the great quantities of oak still found in the mosses, it seems to have constituted the principal species.³¹

At Gargunnock in the county of Stirling, James Robertson noted that both the Carse at Micklewood (a lowland peat bog near the river Forth west of Stirling) and the dryfields (the slopes above the carse) had been previously wooded:

Micklewood undoubtedly signifies a wood much more extensive, than can now be discerned in this country. The probability is, that not only the whole carse of this

²⁸ T.C. Smout, *Nature Contested: Environmental History in Scotland and Northern England Since 1600* (Edinburgh, 2000), pp.37-46; Richard Oram, *The Mythical Great Wood of Caledon* (2024), <https://www.linkedin.com/pulse/mythical-great-wood-caledon-part-1-origins-richard-oram-khkge/>.

²⁹ United Parishes of Crathy and Braemar, County of Aberdeen, OSA, vol. XIV, 1795, p. 337.

³⁰ Smout, *Nature contested*, p. 42.

³¹ Yarrow, County of Selkirk, OSA, vol. VII, 1793, p. 507.

and the neighbouring parishes, but the dryfields also were a forest; as large roots of trees, which are manifestly of very ancient date, are every where found, especially on the sides of the glens.³²

At Kilbarchan, county of Renfrew, Patrick Maxwell noted that the tree stumps in the soil underlying the bog had all fallen in the same direction:

The soil below is a deep white clay, where has formerly been a forest. The oak is perfectly fresh; the other kinds of timber are rotten. The stumps in general are standing in their original position. The trees are all broken over at about the height of 3 feet, and are lying from South-west to North-east.³³

Such descriptions of trees stumps suggest a number of insights. Ministers were aware that there was a history to the landscape and that woodland had been far more widespread in the past, particularly the distant past. Nevertheless, the interest of ministers in landscape change is clear, with some ministers invoking the image of a great wood of Caledon that had once covered the land. In this they were imagining a past landscape radically different from that they saw around them.

Flowers, Shrubs and Fruits

Table 17: Flowers and shrubs

Keyword	Number of accounts	Notes
Bramble	11 (1%)	
Brier	6 (<1%)	
Broom	98 (10%)	Often linked with furze. This number includes some references to Loch Broom and use of birch brooms for cleaning.
Clover	313 (33%)	Usually mentioned in relation to its use in farming
Cowslips	2 (<1%)	
Daisies	8 (<1%)	
Furze	71 (7%)	The word 'gorse' produces no matches. 'Whin' produces 132 matches, but some relate to whinstone, an igneous rock.
Hawthorn	19 (2%)	Includes references to its utility for hedging.
Honeysuckle	6 (<1%)	
Ivy	13 (1%)	Often associated with ruins in the accounts.
Sloes	3 (<1%)	
Woodbine	3 (<1%)	

³² Gargunnock, County of Stirling, OSA, vol. XVIII, 1796, p. 102.

³³ Kilbarchan, County of Renfrew, OSA, vol. XV, 1795, p. 484.

Certain search terms are unreliable and have been excluded. 'Rose' for example produces 106 matches but of these the majority refer to meanings other than the flower such as individuals with the family name 'Rose', the verb as in 'the price of oats rose' or the rose window in a church. Nor is the search term 'thistle' reliable with several matches referring to meanings such as the Order of the Thistle. Other generic terms including 'plants' and 'weeds' have also been excluded as they also produce misleading results.

There are far fewer references to flowers than to trees and woods and by far the largest number of matches are for 'clover'. While an interesting and attractive plant, the great majority of the references concern the role of clover in farming. Clover, in common with some other legumes, can take nitrogen from the atmosphere and 'fix' it in the soil, improving soil fertility. The means by which this is achieved are complex and were not understood until the nineteenth century but the effects were apparent to improvers and crop rotations involving clover were well established by the 1790s.³⁴ For example, in Kirkoswald in Ayrshire, Matthew Biggar noted a contractual obligation on tenants to plant clover: 'The tenants first of all laid down their croft lands with rye grass and clover, took one crop of hay, sometimes two, and rested them four years in pasture.'³⁵ In Wigton, Andrew Duncan noted clover growing naturally and its cultivation:

Over all the improved land in the parish, the fields are sown out with clover and rye grass; though in the low soft ground, where natural clover grows in profusion, rye grass only is generally sown.³⁶

Elsewhere almost all references are to planting clover, as in Elgin described by John Grant: 'The practice of sowing clover and rye-grass, is daily gaining ground. Six pounds of red clover seed, and from 8 to 10 of white, with a bushel of rye-grass, is the general quantity to an acre.'³⁷

Furze (gorse) was mentioned in seventy one accounts and was unusual because it could, depending on circumstances, be viewed by ministers either as useful or as a

³⁴ Thorkild Kjaergaard, 'A plant that changed the world: the rise and fall of clover 1000-2000', *Landscape Research*, vol. 28 (2003), pp. 41-49.

³⁵ Kirkoswald, County of Ayrshire, OSA, vol. X, 1794, p. 487.

³⁶ Wigton, County of Wigton, OSA, vol. XIV, 1795, p. 478.

³⁷ Elgin, County of Elgin, OSA, vol. V, 1793, p. 8.

nuisance. It is mentioned as a fuel (for example in Tain, Brechin and Mayculter), as hedging (as in Logie Pert) or as a weed (Kirkcinner). It was sometimes associated with land that had fallen into neglect, for example in West Kilbride, Ayrshire, where Arthur Oughterson complained about its spread: 'The land was neglected and suffered to run into a state of absolute wilderness; so that whole tracks of it are now covered with furze.'³⁸ Brambles and briars (or briers) were also a nuisance but could form an attractive feature, as described by Thomas M'Courtly at Penicuik:

The indigenous plants are chiefly oak, ash, elm, aspen, Scotch pine, and spruce fir, which are beginning to sow themselves; birch, which is the prevailing wood, rowan, green, fallow, alder, birdcherry, hazle, black and white thorn, of the last of which, in particular, there are some very beautiful and venerable bushes, elder, brier, juniper, bramble, rasp, honeysuckle, ivy, common and evergreen bilberry, cranberry, crowberry, the carduus helenioides, and on the top of the Carlop's Hill, which is the only one of the Pentland range on which it is to be met with, the cloudberry.³⁹

McCourtly references Linnaeus elsewhere in this account and he was familiar with botanical nomenclature, but the language of his account also suggests he had an interest in the picturesque. Brier and bramble were usually dismissed as weeds but McCourtly described them as 'very beautiful and venerable'. Descriptions of honeysuckle or other flowering plants offered an opportunity for picturesque description, but most accounts remain prosaic in their description of flowers. For example at Abbey St. Bathans, John Sked listed species of interest without comment.

On the lands of Abbay and farms adjoining, grow naturally the oak, the mountain-ash, the hazel, the birch tree, besides other trees; the honey-suckle, the anise, the rasp, the juniper, the brier, and bramble, etc. On the lands are plenty of moorfowl, partridge, gray plover, hares, rabbits, etc.⁴⁰

In Tingwall, Shetland such flowers were unusual and only found in gardens, such as that of 'Mr Scott of Scalloway' according to James Sands:

Here are several shrubs, bushes, and even trees, which are scarcely to be seen any where else in these islands... bay, the laurel bay, mezereon, horse chesnut, box, ash, and a good thorn hedge, and brooch, which here is a fine flourishing shrub; also gooseberries, currants, honeysuckle.⁴¹

³⁸ West Kilbride, County of Ayrshire, OSA, vol. XII, 1794, p. 413.

³⁹ Appendix for Penicuik, County of Edinburgh, OSA, vol. XVII, 1796, p. 626.

⁴⁰ Abbey St Bathans, County of Berwick, OSA, vol. XII, 1794, p. 66.

⁴¹ Appendix for Tingwall, Whiteness and Weesdale, County of Shetland, OSA, vol. XXI, 1799, p. 283. 'Mezereon' is the flowering plant *Daphne mezereum*.

Gardens and garden produce are mentioned in over 400 accounts, often in relation to improving landowners. Some descriptions of gardens mentioned garden produce but relatively few describe cultivated flowers.

Table 18: Fruit

Keyword	Number of accounts	Notes
Apple	45 (4%)	Can also refer to potato
Berry	31 (3%)	Generic references include bearberry, blackberries, blaeberry, cloudberrries, cranberries, juniper berries, nub berry, raspberries and strawberries; but also, the River Berry in the County of Kincardine
Gooseberries	15 (1%)	
Rasps/raspberry	10 (1%)	
Sloe	3 (<1%)	
Strawberry	13 (1%)	

Fruit is mentioned in 212 accounts, but with too many other meanings (e.g. ‘hard earned fruit of labour’) to be reliable. Of individual fruits ‘apple’ returned forty five matches, the largest number for any fruit but this number also includes a few references to potatoes which were sometimes referred to as (earth) apples. Orchard fruits were described in detail in the account of Carluke by James Scott, who noted that ‘fruit abounds more in this parish, than any other upon the Clyde, or perhaps even in Scotland’⁴² He included a table of over forty species of apples not including ‘many species of russet’ and over thirty species of pear. Other ministers noted the presence of apple trees as far north as Orphir (Orkney) and Northmaving (Shetland). Different types of berry were described as noted in the table, often growing on the hills.

In summary, the descriptions of fruit and flowers are dominated by agriculture and the utility of different species, with those species that were useful such as clover described approvingly and those that were considered a nuisance, described critically. There are some references to the beauty of flowers, as by Thomas MCourty, but utility is the dominant theme. There were a few ministers who were interested in botany for its own sake, including David Dow (Cathcart), Patrick Graham (Aberfoyle)

⁴² Carluke, County of Lanark, OSA, vol. VIII, 1793, pp. 125.

and John Burgess (Kirkmichael, Dumfries). One outstanding example was William Bennet of Duddingston who was an expert on aquatic flora and whose account is described in more detail in chapter eight.

One of the most striking features of the descriptions of flora in the accounts is the amount of information on different habitats across Scotland. There are hundreds of descriptions of woodlands, plantations, moors, heathlands, peat bogs and other habitats and within the space available in this survey it has been possible to include only a small selection of these descriptions. A second feature is the repeated emphasis in the accounts on utility: species that are useful such as clover are mentioned much more frequently than others. In contrast, species like broom or furze that are associated with waste land or poorly managed land are generally mentioned with negative comments. This suggests an interest in flora but also highlights the values of ministers who welcomed species that were useful or productive but shunned those that were a nuisance. Most of the descriptions of the beauty of nature are of landscapes that are ordered and productive, particularly where a landowner had created new plantations. Wild landscapes received less praise. The development of romantic attitudes towards nature, praising the wet and the wild, is relatively rare in the accounts

Fauna

As with flora, descriptions of animals in the OSA are dominated by domestic or farmed animals. This is apparent in the number of accounts that mention different types of animals given in the table below.

Table 19: Fauna

Keyword	Number of accounts	Notes
Animals	429 (45%)	
Birds	229 (24%)	
Cattle	759 (80%)	
Cows	459 (48%)	
Fish	504 (53%)	Matches include 'fishes' and 'fishing'
Horses	770 (82%)	
Sheep	744 (79%)	
Wild animals	26 (3%)	Under represents wild animal species listed below
Zoology	2 (<1%)	

While the term 'zoology' had been in use since the mid seventeenth century, it has only two mentions in the OSA, both in the accounts of the Aberdeen universities, rather than in the parish accounts.⁴³ At King's College it was noted that a museum of natural history had been furnished with 'a pretty large assortment of specimens in mineralogy and zoology' for the use of students.⁴⁴ At Marischal College zoology was mentioned as part of the teaching of natural history which also included meteorology, hydrology, geology, mineralogy, and vegetation.⁴⁵ As with flora, the teaching of natural history to aspiring ministers in the Aberdeen and other universities, combined with natural history collections of the universities, may have given ministers knowledge and confidence to write about the fauna of their parishes.

The generic terms 'animals' and 'fish' record a large number of matches. 'Animals' included both domestic and non-domestic species of which farmed animals (cattle, sheep and horses) recorded the largest number of matches. As noted in the introduction to the thesis, the purpose of this study is to examine ministers' interest and attitudes toward the natural environment so this section, as with the section above on flora, discusses 'wild' animals rather than the large number of references to farm animals.

⁴³ The first entry for 'zoology' in the OED is from 1663.

⁴⁴ University and King's College of Aberdeen, OSA, vol. XXI, 1799, p. 88. The university accounts were published anonymously and were not necessarily the work of ministers.

⁴⁵ Marischal College and University of Aberdeen, OSA, vol. XXI, 1799, p. 119.

Animals

Table 20: Wild animals

Keyword	Number of accounts	Notes
Badger	60 (6%)	
Fox	132 (14%)	
Frog	11 (1%)	Of which 8 refer to the animal
Hare	137 (14%)	
Polecat/Foumart	56 (5%)	‘Polecat’ has 52 matches, and ‘foumart’ 4.
Otter	86 (9%)	Includes one reference to Otter Ferry (Loch Fyne) and other references to ‘otter skins’.
Rabbit	80 (8%)	
Rat	31 (3%)	
Weasel	37 (3%)	
Wolf/Wolves	27 (2%)12 (1%)	Includes 12 matches for ‘Wolf’ and 15 for ‘Wolves’.

Other animals mentioned include the adder (eight accounts), ‘ermine’ (stoat) hedgehog and mouse (all mentioned in nine accounts) and the wild cat (six accounts). There are a number of species that have been excluded. ‘Deer’ (both red deer and roe deer) have been excluded because of many confusing matches to place names including Deer, New Deer, and Deerness, or to fish roe and roeberries. ‘Mole’ has been excluded because of matches referring to coastal breakwaters and ‘seal’ is excluded because of many matches referring to ‘seal dykes’ and seals attached to legal documents. The relatively small number of accounts that mention mice or rats is perhaps surprising. Occasionally their absence was considered noteworthy as in Unst, the most northerly parish of the British Isles: ‘Rats, mice, frogs, toads, and adders are unknown here.’⁴⁶ It may be that, in most of Scotland, they were so familiar that they were not thought worthy of mention.

Hares are frequently mentioned, sometimes as the object of the hunter as described by George Donaldson in Kennethmont ‘the sportsman, who delights in more active diversion, can traverse hills and dales with his dog and his gun in search of hares, plovers, ducks, rails, grouse, partridges, snipes, etc. in their season.’⁴⁷ A more

⁴⁶ Unst, County of Shetland, OSA, vol. V, 1793, p. 188.

⁴⁷ Kennethmont, County of Aberdeen, OSA, vol. XIII, 1794, p. 80.

unusual reference to the hare comes from the rationally minded minister of Clunie in Perth, William MacRitchie:

Superstitions, charms, and incantations, have lost their power. Cats, hares, magpies, and old women, cease to assume any other appearance than what nature has given them; and ghosts, goblins, witches, and fairies have relinquished the land.⁴⁸

It is interesting that the minister chose to mention these supernatural associations and this comment raises the question whether, for some members of congregations, such associations continued. It is quite possible that the disenchantment of landscape following the reformation described by Walsham applied more to university educated ministers than to members of congregations.⁴⁹

Descriptions of 'wild' animals often follow the methodology of empirical natural history by including a list of species found in the parish, and an indication of whether they were a nuisance. At Kilmadock (Dounie) Alexander MacGibbon mentioned hares, rabbits, foxes and badgers: 'The braes on the north-east side of Cambuswallace house have been long a receptacle for badgers and foxes; but these mischievous animals are now much banished.'⁵⁰ He also noted 'great numbers of otters' and also stags, partridges, moor fowl and wild geese. Similarly at Tullynessle Andrew Marshall provided a list, noting the effects of pest control:

Of wild animals, there are plenty of hares, a few deer of the roe kind, and too many foxes. The hills abound with grouse and plover, the flat parts of the country with partridges, snipes, wild ducks, and almost every kind of birds commonly found in the north of Scotland; but neither raven, rook, nor jackdaw, have been allowed to breed in the parish for several years past.⁵¹

Some species are described without judgment (hares, deer, grouse, plover, partridges, snipes and ducks) but others are identified as pests including foxes and corvids (ravens, rooks, and jackdaws). At Kilsyth Robert Rennie also provided a short list: 'The animals of this parish are such as are common over all the neighbourhood. Foxes, badgers, polecats, weasels, and hedgehogs, abound. A few otters and rabbits

⁴⁸ Clunie, County of Perth, OSA, vol. IX, 1793, p. 253.

⁴⁹ Alexandra Walsham, *The Reformation of the Landscape: Religion, Identity, and Memory in Early Modern Britain and Ireland* (Oxford, 2011).

⁵⁰ Kilmadock, County of Perth, OSA, vol. XX, 1798.

⁵¹ Tullynessle, County of Aberdeen, OSA, vol. IV, 1792, p. 29.

may be found also; and the hare is frequently to be seen.’⁵² He went on to describe birds, including birds of prey of which ‘the most destructive of all, is the grey glade, or kite, as it is commonly called’.

At Portree on the isle of Skye the minister wrote an account of ‘birds, and other sea and land animals’ listing some migratory species, fowls and quadrupeds.⁵³ He noted that ‘two species of serpents are to be found in the hills of this country, whose bite, though not fatal, is very venomous, attended with much pain and great swelling’ On the Isle of Gigha, William Fraser listed pest species that were present on the island or absent from it.

The only destructive animal is a small species of wild cat, which seldom comes near the farm houses, but keeps near the shore and among cairns, where it kills rabbits, of which there are many in the island. Rats and mice are sometimes troublesome. The amphibious animals are seals and otters, but not very numerous. There being no foxes, polecats, weasels, etc. poultry of all kinds are reared in great plenty.⁵⁴

Fraser is one of the few ministers to mention mice and rats, even though such rodents must have been troublesome across most parishes in Scotland. He went on to list birds on the island:

In winter the island is visited by the swan and woodcock, in summer by the swallow, cornraik (or cornrail), and cuckoo. The other birds frequenting it are, wild geese, ducks, and all the species of sea fowl common on the west coast: Pigeons, plovers, ravens, hooded crows, starlings, sparrow hawks, and jackdaws are very numerous. Of the last there are two kinds; one with a dark blue head, all the rest black; another with red feet, having the body and head black.⁵⁵

Fraser was alert to the range of species on the island. His reference to the chough (red footed jackdaw) is of interest, as the species is no longer resident on Gigha.

A number of themes emerge from these accounts. As with flora, ministers adopted the empirical method of listing the species found in the parish and they often identify pests. Beyond the utilitarian descriptions of species, some ministers appear to have been keen observers of the natural world, particularly of bird life.

⁵² Kilsyth, County of Stirling, OSA, vol. XVIII, 1796, p. 243.

⁵³ Porttree, County of Inverness, OSA, vol. XVI, 1795, p. 148. The author was Alexander Campbell who, when he wrote the account, was schoolmaster in Portree, but who became minister of the parish in 1799.

⁵⁴ Gigha and Cara, County of Argyle, OSA, vol. VIII, 1793, p. 51.

⁵⁵ Gigha and Cara, pp. 51-52.

Birds

There are many descriptions of birds in the OSA, with mention of them in 229 (24%) accounts. These descriptions can offer insights into ministers' interests and attitudes, particularly towards different types of bird including songbirds, seabirds, migratory birds and birds considered a nuisance. Fewer birds were domesticated or farmed than other animals with poultry an obvious exception. Some bird species were pests, but others could be appreciated for their interest or beauty alone. Some ministers simply listed the species in the parish, but others went further to comment on the attributes of birds, their habitats, their seasonality, whether they were a nuisance or whether, in a few cases, a delight. The hunting of birds for pleasure or for food was mentioned in a few accounts but far more accounts mentioned the nuisance caused by some species, principally corvids (crows, etc.) and raptors (birds of prey).

The tables below illustrate the wide variety of species that were of interest to ministers. The division into groups (songbirds, game birds, etc.) is for convenience rather than ornithological accuracy. Migration is of special interest and is discussed in a section at the end.

Table 21: Songbirds

Keyword	Number of accounts	Notes
Blackbird	30 (3%)	
Finch	11 (1%)	Includes 'Goldfinch' and 'Bullfinch'
Linnet	29 (3%)	
Starling	13 (1%)	
Thrush	33 (3%)	Includes 'Missel Thrush'

Andrew Hutton at Edzell, in Forfar, listed the songbirds of the parish: 'Birds of song are, linnets, thrush, blackbird, red-breast.'⁵⁶ In Selkirk, Thomas Robertson mentioned songbirds as part of the flora and fauna: 'The rivers, fields, and woods, in the neighbourhood, abound with all the fish, game, birds of song, of prey, and of the migratory species, common in the southern parts of Scotland.'⁵⁷ Sometimes ministers suggested that there were no species of outstanding interest, for example

⁵⁶ Edzell, County of Forfar, OSA, vol. X, 1794, p.104.

⁵⁷ Selkirk, County of Selkirk, OSA, vol. II, 1792, p. 447.

William Ranken at Sanquhar: 'The birds of prey, of song and of the migratory species are those which are abundantly common in the south of Scotland. The bull-finch is found in Elliock woods.'⁵⁸ Others provided many more details, for example John Burgess at Kirkmichael near Dumfries who listed forty one types of birds, including songbirds, in the parish.⁵⁹

While they feature in such lists there are relatively few descriptions of individual songbirds. The linnet is noted as far north as Unst in Shetland among: 'starlings, grey linnets, larks, sparrows, robins, wrens, horse-gauks, cornkraiks, land-larks, and stone-chatters.'⁶⁰ David Mackay at Reay in Caithness provided a long list of forty nine species of bird including 'tillings, linnets, thrushes, hill sparrows, common sparrows, wrens, buntings, larks, swallows, yellow hammers, water-wagtails, titmice.'⁶¹ None of the songbirds mentioned were listed as pests and there is no mention of them as a source of food. While most bird lists are presented with little comment, songbirds were sometimes mentioned as source of pleasure, as by Michael MacCulloch in Bothwell:

The woody banks of the Clyde and Calders, are frequented by the usual tenants of the groves of Caledonia, particularly the thrush and blackbird. The village and manse, on account of the planting, are highly favoured with the music of these two melodious birds, especially the last.⁶²

At Tannadice in the county of Forfar, John Jamieson was well informed about the ring ouzel, a bird frequently mistaken for the blackbird: 'Besides partridge, grouse, the fieldfare, and other common birds, they have one called the oswald, or oswat, very much resembling a blackbird.'⁶³ The minister at Langholm, Thomas Martin, enjoyed the songbirds in the riverside woods.

In summer, the woods which extend along the banks of the Esk, and which are supposed to occupy about 500 acres, are vocal with the tuneful warblings of thrushes, blackbirds, larks, linnets, etc. which, together with the cooing of the

⁵⁸ Sanquhar, County of Dumfries, OSA, vol. VI, 1793.

⁵⁹ Kirkmichael, County of Dumfries, OSA, vol. I, 1791, pp. 60-61.

⁶⁰ Unst, County of Shetland, OSA, vol. V, 1793. The 'horse-gauk' is a Shetland name for the snipe.

⁶¹ Reay, County of Caithness, OSA, vol. VII, 1793, p.574. It has not been possible to identify the bird listed as 'tillings'.

⁶² Bothwell, County of Lanark, OSA, vol. XVI, 1795, p. 303.

⁶³ Tannadice, County of Forfar, OSA, vol. XIX, 1797, p. 377.

wood pigeons, form a fine chorus to regale the ear of the delighted traveller as he passes through these enchanting groves.⁶⁴

The reverse was the case at Muirkirk in upland Ayrshire where there was little woodland and fewer songbirds: ‘It is to be regretted that there are few songsters of the grove; and indeed, except the sky-lark, few of the spring, as the melody of the blackbird and thrush is seldom heard.’⁶⁵ While most descriptions of flora and fauna are utilitarian, songbirds stand out as an example of the pleasure and beauty that could be found in the natural environment. If songbirds received positive comments, other types of birds attracted more mixed comments, for example game birds and raptors.

Table 22: Gamebirds

Keyword	Number of accounts	Notes
Black Cock	19 (2%)	Mainly mentioned in highland parishes
Grouse	42 (4%)	
Partridge	100 ((10%)	
Pheasant	9 (<1%)	An introduced species
Plover	103 (10%)	A generic term that may include more than one species
Snipe	61 (6%)	
Woodcock	92 (9%)	

Game birds received many more mention than songbirds with particularly large numbers of references to plover and partridge. There are ambiguities in the naming of gamebirds and their identification by ministers was not always precise. ‘Plover’ may refer to the golden plover *Pluvialis apricaria* but some accounts distinguish between the plover and the green plover which may be the lapwing *Vanellus vanellus*. At Barvas on Lewis for example Donald Macdonald noted that the parish: ‘abounds with pidgeon, plover, snipe, and a vast variety of wild-geese and ducks. The swan, woodcock and green plover, appear in their season. The coast abounds with a variety of sea-fowls.’⁶⁶ At Kirkhill on the Beauly Firth to the west of Inverness Alexander Fraser compiled an even more confusing list referring to three types of plover: ‘There

⁶⁴ Langholm, County of Dumfries, OSA, vol. XIII, 1794, p. 597.

⁶⁵ Muirkirk, County of Ayrshire, OSA, vol. VII, 1793, p. 600.

⁶⁶ Barvas, County of Ross and Cromarty, OSA, vol. XIX, 1797, p. 272.

are the crane, curlew, plover, half plover, sandy lark, page plover.’⁶⁷ In coastal areas ‘plover’ may refer to the ringed plover *Charadrius hiaticula*. Some of these issues are also evident in the account of Tiree:

Many thousands of gray plovers are seen together, especially upon the reef or great plain; they observe the same season with the wild geese in hatching elsewhere. The green plovers hatch in the island. Rails are very numerous.⁶⁸

The mention of large numbers of birds in these accounts is striking. ‘Rail’ probably refers to the corncrake *Crex crex* which is now confined in small numbers to the islands of the north and west of Scotland, but which in the account of Tiree, was described as numerous. Similarly, the numbers of partridge and golden plover are much reduced to the extent that the grey partridge is now designated a ‘red list species’ in Scotland.⁶⁹ The golden plover is also more limited in range and numbers.⁷⁰ Although no comprehensive survey of bird numbers exists for the eighteenth century in Scotland the OSA suggests that ministers lived in a time of relative abundance of these bird species.

Table 23: Raptors and corvids

Keyword	Number of accounts	Notes
Crow	66 (6%)	Can refer to other corvids including rooks and jackdaws.
Eagle	42 (4%)	
Hawk	87 (9%)	
Jackdaw	13 (1%)	Includes references to ‘red legged jackdaw’ (chough)
Magpie	28 (2%)	
osprey	3 (<1%)	Also referred to as fish hawk

‘Corvids’ include crows, ravens, and jackdaws, and ‘raptors’ include eagles, hawks, kites and ospreys. Some ministers confused different species of corvid, for example

⁶⁷ Kirkhill, County of Inverness, OSA, vol. IV, 1792, p. 114.

⁶⁸ Tiree and Coll, County of Argyle, OSA, vol. X, 1794, p. 401.

⁶⁹ Andrew Stanbury, Mark Eaton, Nicholas Aebischer, Dawn Balmer, Andy Brown, Andy Douse, Patrick Lindley, Neil McCulloch, David Noble and Ilka Win, ‘The status of our bird populations:’, *British Birds* vol. 114 (2021), pp. 723–747.

⁷⁰ Raymond Parr, ‘The Decline to Extinction of a Population of Golden Plover in North-East Scotland’, *Scandinavian Journal of Ornithology*, vol. 23 (1992), pp. 152-158.

Alexander Peter at Logie and Pert, who referred to: 'crows of different kinds, especially the rook, the raven, and the carion crow.'⁷¹ At Campsie, in the county of Lanark, James Lapslie noted the variety of corvids: 'the corbie or raven, the hooded or carrion crow, rooks, jackdaws, and the red legged crow, are natives of this district'.⁷² Both corvids and raptors were described as pests. Lapslie reported on the fears of shepherds about the golden eagle: 'a visit of which amongst the flock is dreaded as much as that of the fox. But of all the birds of prey amongst us, the hen-harriers, or white aboon-glade, as he is called, is the most destructive to game, both partridges and muirfowl.'⁷³ He went on to describe in graphic terms the impact of ravens.

I have seen, again and again, a raven attack a lamb, beat with its wings about its head, till the poor creature fell headlong over a precipice; and before the shepherd could climb to the spot, the raven had picked out its eyes.⁷⁴

However, he noted that the numbers of predators had declined: 'It may be observed, that beasts of prey are every day becoming scarcer.' This, he explained, was in part due to employment of a professional hunter paid for by a levy on tenant farmers.⁷⁵

Crows also attracted hostility, for example among the arable famers at Whitekirk and Tynninghame near Haddington, where James Williamson reported that they destroyed 'a vast quantity of grain'.⁷⁶ Similarly at Delting in Shetland, John Morison complained that: 'eagles, corbies, and crows, often do great damage to the corn and young lambs.'⁷⁷ This was challenged by Alexander Brodie, at Carnbee in Fife, who suggested rather than eating grain the crows were in fact picking off another pest, the 'cobworm'. He recorded how a servant of the Earl of Kellie had shot some crows in an oatfield and 'upon opening up their stomachs, he found them quite full of cobworm, and not one grain of oats'.⁷⁸ Most ministers, however treated corvids as pests, damaging to farming and best destroyed. Unlike songbirds, corvids were primarily described in utilitarian terms.

⁷¹ Logie Pert, County of Forfar, OSA, vol. IX, 1793, p. 38.

⁷² Campsie, County of Stirling, OSA, vol. XV, 1795, p. 324.

⁷³ Campsie, p. 324.

⁷⁴ Campsie, p. 324.

⁷⁵ Campsie, p. 324.

⁷⁶ Whitekirk and Tynninghame, County of Haddington, OSA, vol. XVII, 1796.

⁷⁷ Delting, County of Shetland, OSA, vol. I, 1791, p. 407.

⁷⁸ Carnbee, County of Fife, OSA, vol. XIII, 1794, p. 29.

Descriptions of eagles sometimes mixed respect with concern as in the description by Dugal McDougal at Lochgoilhead and Kilmorich in Argyll.

With regard to native birds, the eagles of this country are of a prodigious size, and remarkable for their strength and ferocity. They make great havock among the lambs in the end of spring, when, in addition to the cravings of their own hunger, they are impelled to rapine, by the cries of their young.⁷⁹

At Kiltarlity, John Fraser was similarly impressed by the power of birds of prey.

The large blue hawk, about the size of a common hen, nestles in the rocks of Mayne. This is one of the most ravenous birds in this country: though not so strong as the eagle, it is much more fierce and agile; and when the eagle and this bird fight, the former is commonly worsted.⁸⁰

The blue hawk is possibly a peregrine falcon. Most ministers seem unperturbed by efforts to eradicate such raptors. At Aberfoyle, Patrick Graham noted that: 'the black eagle builds in some of the more inaccessible rocks; but, as great pains have been taken to destroy the species, it is now rare.'⁸¹ At Alford in the county of Aberdeen Thomas Birnie reported that: 'the country is infested with hawks of almost all sorts; the falcon, sparrow-hawk, martins, and a rare species, commonly called blue sleeves, and with kites of different sizes and descriptions.'⁸²

Of interest are the few references to the red legged jackdaw or crow, now known as the chough. The chough was reported in six accounts in the south and west and being relatively conspicuous from the colour of its legs was probably accurately identified. As with some songbirds. this points to a wider distribution of the species in the 1790s than today.

⁷⁹ Lochgoil-Head and Kilmorich, County of Argyle, OSA, vol. III, 1792, p. 175.

⁸⁰ Kiltarlity, County of Inverness, OSA, vol. XIII, 1794, p. 514.

⁸¹ Aberfoyle, County of Perth, OSA, vol. X, 1794, p. 119.

⁸² Alford, County of Aberdeen, OSA, vol. XV, 1795, p. 475.

Migratory Birds

Table 24: Migratory birds

Keyword	Number of accounts	Notes
Migratory	88 (9%)	
Cuckoo/Cuckow	83 64 (6%)	‘Cuckoo’ is mentioned in 64 accounts and ‘Cuckow’ in 19
Geese	125 (13%)	
Swallow	67 (6%)	Note possible confusion with verb

Bird migration was a subject that was (and to an extent still is) imperfectly understood.⁸³ With over eighty references to the term ‘migratory’ it was of interest to many ministers, who noted the arrival or departure of birds at different times of the year. Some ministers described species that were seen in the parish only in summer, disappearing in winter to reappear in the following spring while others noted species that appeared in the autumn to over winter in Scotland. On the west coast in the parish of the small isles (Eigg, Rum, Canna, and Muck) Donald McLean noted that: ‘our migratory birds are rails, cuckows, woodcocks, swallows, arctic gulls, and solan geese’.⁸⁴ In contrast, on the east coast at Birnie near Elgin, Joseph Anderson described seasonal birds without mentioning migration: ‘The lapwing appears in March, the cuckoo in April, and the swallow in May; they all begin to disappear about the end of summer.’⁸⁵ More details were provided by John Hunter at Oxnam in the county of Roxburgh:

The woodcock, and fieldfare appear in the beginning of October, and remain during winter. The curlew, the green and the grey plover, come in March, breed in the moors, and go in the latter end of harvest. The cuckoo, swallow, dottrel, and land and water rail, appear in May, hatch their young, and then disappear.⁸⁶

Sometimes ministers refer to ‘birds of passage’, as in the account of Canisbay in Caithness by John Morison: ‘Birds of passage are, the green plover, wild goose, snow-

⁸³ A useful introduction is Peter Berthold, *Bird Migration: a General Survey* (Oxford, 2001), especially chapter 3, ‘History of bird migration studies’.

⁸⁴ Small Isles, County of Inverness, OSA, vol. XVII, 1796, pp. 276-277.

⁸⁵ Birnie, County of Elgin, OSA, vol. IX, 1793, p. 157.

⁸⁶ Oxnam, County of Roxburgh, OSA, vol. XI, 1794, p. 320.

fowl, wagtail, swallow and rail. The snow-fowl, in the winter, are inconceivably numerous.’⁸⁷

Some ministers offer more details, for example at Caputh, by the river Tay, where William Inverarity recorded the dates of arrival:

Of these, the cuckoo, swallow, lapwing, sandy-lark, plover, rail or corncraik, seagull, seamagpie, pictarny or kittywake, curlew or whaap, and clocharet, are summer birds. The fieldfare, woodcock, and wildgeese, are winter birds. The swallow appears about the 14th of April; the earliest time of the cuckoo's being heard, is the 25th of April, but usually not before the 2d or 3d of May. It is heard till the 10th of June, and last year, as late as the 3d of July.⁸⁸

To the north at Tarbat (Tarbatness), on the east coast of Ross and Cromarty, George Balfour also reported on some local summer and winter movements:

The green plover or lapwing comes early in the spring, and quits the country again in the months of July and August. The swallow and cuckow come in the summer, and disappear in the middle of harvest; when these birds take their departure, numerous flocks of curlew mountain plovers, wild geese and swans return with their young ones from the hills and lochs, where they had hatched and and reared them in the summer months.⁸⁹

At Auchtermuchty in Fife James Lister also gave details of winter and summer migrants and information on their origins and destinations:

The migratory birds are the wild goose, the lap-wing and the fieldfare. The wild geese make their appearance about the first of November, and leave this place about the first of April. The lap-wing is as it were the harbinger of spring. When that is early, they appear in February, but if the weather is severe, they come not till March; they go for England or Ireland about the end of September. The fieldfare comes from the northern countries in the month of December; but when the winter is mild it makes a very short stay.⁹⁰

He went on to comment on the impact of agricultural changes on lapwings: ‘They are much deminished in numbers within these few years, because the gentlemen in this neighbourhood are now draining their mosses and cultivating their muir grounds, the usual haunts of this beautiful though gloomy bird.’⁹¹ This observation points to the impact of agricultural change on biodiversity, particularly the impact of draining on wetland birds. There is also a hint of regret in his description of: ‘this beautiful though

⁸⁷ Canisbay, County of Caithness, OSA, vol. VIII, 1793, p. 159.

⁸⁸ Caputh, County of Perth, OSA, vol. IX, 1793, p. 490-491.

⁸⁹ Tarbat, County of Ross and Cromarty, OSA, vol. VI, 1793, p. 425.

⁹⁰ Auchtermuchty, County of Fife, OSA, vol. VI, 1793, p. 339.

⁹¹ Auchtermuchty, p. 339.

gloomy bird'. George Moir at Peterhead wrote an impressive account of bird life in the parish with details of migration:

The cuckoo and corn-rail generally appear in the months of April and May, and are seldom heard after the month of August. The lapwing generally arrives in February or March, and leaves this country in the end of autumn; lapwings of late have been observed to reside in this part of the country all winter; the woodcock makes his appearance about the end of harvest; they arrive here very lean, and in a few days become very fat; there can, be little doubt of their coming from Norway and the east country; they are generally observed first on the east coast.⁹²

The detail of his observations and understanding of migration suggest that Moir could be properly described as a minister naturalist, one of many who appear in the OSA.

These extracts suggest most ministers who described seasonal birds were convinced of bird migration, but not all were, as the account of Rescobie in Forfar demonstrates. The minister, Thomas Wright, doubted that swallows were migratory, suspecting they might be overwintering underwater in Rescobie Loch:

I have been, for some seasons, pretty attentive to the first appearance of this bird; but not accurate enough to mark the dates, till last spring, when, on the 2d of May 1793, I saw them, for the first time, pretty early in the morning, in considerable numbers on the loch (about 18 yards from the bottom of the garden), from which they seemed to be just then in the process of emerging; though, as there was some rippling on the water, it was difficult to discern the breaking of the surface; but the observer is positive, they just then arose from the lake, and therefore must have lodged or lain somehow at the bottom, since the time of their disappearing last year.⁹³

Wright, like Moir, was observant but came to a very different conclusion. His argument for hibernation appears to be unique in the OSA but was not unusual among other natural historians earlier in the century. Carl Linnaeus was not convinced that swallows were migratory and Gilbert White (1720–1793) believed that some swallows remained in hibernation in England through the winter.⁹⁴ In his letters to Thomas Pennant and Daines Barrington, written between 1769 and 1787 and subsequently collated and published in 1789 as *The Natural History of Selborne*, White repeatedly returned to a discussion of swallows and whether they might be

⁹² Peterhead, County of Aberdeen, OSA, vol. XVI, 1795, p. 561.

⁹³ Rescobie, County of Forfar, OSA, vol. XIV, 1795, p. 603.

⁹⁴ Ashleigh Green, 'Cultural responses to the migration of the barn swallow in Europe', *ANU Historical Journal*, vol. 2 (2019), pp. 87-107.

hibernating.⁹⁵ White had evidence of migration from his brother, who had seen swallows crossing the Mediterranean in spring and autumn, yet he could not dispel the notion that some swallows might overwinter in England.⁹⁶ White was more sceptical that small songbirds such as warblers could migrate over long distances. While swallows and swifts were strong flyers, he observed that smaller songbirds such as nightingales and black caps 'are very ill provided for long flights' and would struggle to fly over 'vast seas and continents'.⁹⁷

White was an observant and influential naturalist, so it is notable that his doubts about migration were not more widely shared in the OSA, with only one minister suggesting an alternative theory. The accounts do not tell us how or why ministers had come to accept bird migration, but they do suggest that ministers who wrote about seasonal birds were well informed about it. The descriptions in the accounts appear to follow secular, scientific reasoning. No minister appears to have suggested a theological explanation for migration.

Table 25: Seabirds

Keyword	Number of accounts	Notes
Cormoran/Scart	37(3%)	'Cormorant is mentioned in 28 accounts and 'Scart' in 9.
Ember	4(<1%)	Great Northern Diver
Gull	50(5%)	Includes herring, black backed and other gulls
Kittywake/Kittiewake/ Kettywake	3(<1%)	Kittiewake (1) kettywake (1)
Auks/Marrots	11 <1%)	'Auks' are mentioned in 4 accounts and 'Marrots' in 7
Puffin	5 (<1%)	Oystercatcher, also called sea piet (1) and sea pies; the pyet or pyot is a magpie
Oystercatcher/Sea pyet/ Sea Pie	2 (<1%)	

Compared to terrestrial migratory birds, there are relatively few mentions of seabirds, many of which were also seasonal and spent much of the year away from their coastal nesting sites. The search term 'gull' produces 47 matches most, but not all, from coastal communities. As with other birds, most entries for gulls and other

⁹⁵ Gilbert White, *The Natural History and Antiquities of Selborne with a preface by Richard Jefferies*, (London, 1887).

⁹⁶ White, *Natural History*, pp 133-134.

⁹⁷ White, *Natural History*, p. 159.

seabirds are contained in a list of the species found in the parish. An example is from the Isle of May, part of the parish of Anstruther Wester in Fife, described by James Forrester as: ‘frequented by a great variety of sea fowl, such as kittiewakes, scarts, dunters, gulls, sea-pyets, marrots, etc.’⁹⁸

At Kirkcudbright, Robert Muter gave more details:

The sea fowls are barnaile geese, curlews, herons, red legged crows or daws, sand pipers, called here land trippers, sea pies, wild ducks, scale ducks, teals, puffins, scarfs, or black duckers, herring gulls, gray gulls, winter gulls, or maws, common sea maws, black caps, or sea crows, terns, etc.⁹⁹

Not all the birds listed by Muter are strictly seabirds; some like sandpipers or red legged crows (choughs) just happen to live close to the sea. The names of seabirds in the OSA can be bewildering and is not always possible to be certain of the identity of the birds mentioned. The marrot, for example was sometimes referred to as an auk and could be the razorbill, which is also referred to as a black billed auk or lesser guillemot.¹⁰⁰ George Barry at Kirkwall compiled a list that is particularly challenging to understand, including: ‘gulls of many kinds, the ember goose, the dunter or eider duck, the fly goose, the awk, the lyre, and the tyste, the pickternie, the norie, and culterneb, the calaw, the scarf, and the seapie or the chaldrick.’¹⁰¹ This is a reminder of the diversity of bird names around Scotland, a tradition which continues in some parts of the country.¹⁰²

In some coastal communities, seabirds provided a supplement to the winter diet, as at Wick in Caithness where William Sutherland noted:

The rocks along the coast of this parish abound with great variety of sea-fowl especially marrots, scarts, gulls, wild pigeons, etc. affording a great deal of rock-shooting, the produce of which the fishermen take up in their boats, salt and eat in winter.¹⁰³

William Jack reported the same in the parish of Northmaving in Shetland where: ‘the holm and isle of Stenness, which abound with kettiwakes filling every projection and

⁹⁸ Anstruther Wester, County of Fife, OSA, vol. III, 1792, p. 84.

⁹⁹ County of Kirkcudbright, OSA, vol. XI, 1794, p. 14.

¹⁰⁰ Scottish National Dictionary entry for ‘Marrot’.

¹⁰¹ Kirkwall, County of Orkney, OSA, vol. VII, 1793, p. 546.

¹⁰² Robin Jackson, *A Guide to Scots Bird Names* (2013), <https://www.researchgate.net/publication/364262419>.

¹⁰³ Wick, County of Caithness, OSA, vol. X, 1794, p. 4.

every hole, which can afford them any shelter. The new fledged young, are much esteemed, as delicate food, and taken in great plenty'.¹⁰⁴ However one minister from the north, John Morison at Canisbay, in Caithness took a different attitude:

In the summer months, the swarms of scarfs, marrots, faiks, etc. that come to hatch in the rocks of Dungisbay and Stroma, are prodigious. The gun makes frequent and bloody havock among them. They are shot for amusement from boats, and the common people appropriate their flesh and feathers to their own use. The sport is cruel and unprofitable, as numbers die upon their young in the nest, or expire before they reach the edge of the projecting shelve.¹⁰⁵

Morison was a poet and hymn writer and his sensitivity to the killing of seabirds is unusual.¹⁰⁶ In the OSA the killing of birds was usually reported without critical comment.

Sealife

Fish are mentioned in the accounts of many coastal parishes and in some inland parishes with lochs or large rivers. In most of the coastal parish accounts fish are mentioned in relation to fishing, usually as a list of species caught and landed in the parish. These accounts often contain details about methods of fishing, processing and sale of fish, and employment in the fishing industry.

Table 26: Sealife

Keywords	Number of accounts	Notes
Fish	423 (45%)	Includes 323 matches for “fishing”
Cod	174 (18%)	
Haddock	27 (2%)	
Herring	116 (12%)	
Ling	123 (12%)	
Lobster	22 (2%)	
Shellfish	55 (5%)	
Salmon	412 (43%)	
Whale	14 (1%)	Also includes dolphins

¹⁰⁴ Northmaving, County of Shetland, OSA, vol. XII, 1794, p. 350.

¹⁰⁵ Canisbay, County of Caithness, OSA, vol. VIII, 1793, pp. 159-60.

¹⁰⁶ ‘The Rev. John Morison D.D., Minister of Canisbay, Caithness 1780-1798’ in Alfred W. Johnston and Amy Johnston, *Old Lore Miscellany of Orkney Shetland Caithness and Sutherland*, vol. 5. (London, 1912), pp. 166-175.

The number of accounts that include reference to fish or fishing is higher than the number for birds, but this does not necessarily indicate a greater interest in the natural history of fish over birds. Rather it indicates the much greater importance fish to the local economy of many coastal parishes. Interest in fish was primarily utilitarian. As with other fauna the entries for fish most often comprise a list of species. In the town of Ayr, William McGill summarised the main species: 'The coast affords plenty of salmon, at least for home consumption every year, and a great variety of excellent white fish, cod, ling, haddocks, whittings, skate, flounders, etc. No shell fish, except a few crabs and lobsters.'¹⁰⁷ He went on to describe in detail the methods of fishing, the organisation of the industry and its marketing. For example, 'white fishing is mostly carried on by a society of people from Aberdeenshire, who pursue their business with great diligence and success.'¹⁰⁸

At Kilmore on the Isle of Bute John Hamilton listed the local species drawing attention to the sail fish (basking shark) which provided a rich source of oil:

The sea-coast abounds with fish of different kinds, such as herring, salmon, scate, cod, ling, lythe, flounder, haddock, whiting, etc. but the inhabitants have not acquired the art of being very beneficial to themselves in fishing any of these but herring. There is also in these seas a huge fish, called Sail-fish, which is caught by sticking them with sharp-edged instruments, of the harpoon kind.¹⁰⁹

An example of freshwater fish is provided for Moulin near the river Tummel by Alexander Stewart: 'The rivers contain trout, eel, par, minnow, but of no superior quality. Loch Broom has abundance of trout, superior in size and flavour to the river trout.'¹¹⁰ Stewart went on to describe spear fishing for salmon: 'almost all bought up for the London market.' According to James Bell the river Tweed at Coldstream contained 'bull-trouts, whittings, gilses, salmon, and all other kinds of fish common to the rivers in the south of Scotland'. As in Moulin the salmon were sent to London 'by means of the Berwick smacks, and the recent discovery of carrying fresh fish to a distant market, preserved in ice.'¹¹¹

¹⁰⁷ Appendix for Ayr, County of Ayrshire, OSA, vol. XXI, 1799, p. 38.

¹⁰⁸ Appendix for Ayr, p. 38.

¹⁰⁹ Kilmore, County of Bute, OSA, vol. IX, 1793, p. 168.

¹¹⁰ Moulin, County of Perth, OSA, vol. V, 1793, p. 52.

¹¹¹ Coldstream, County of Berwick, OSA, vol. IV, 1792, p. 412.

The description of the parish of Peterhead by George Moir, one of the longest accounts in the OSA at ninety pages, includes five pages of description of fish and fishing: Moir observed that: 'There is great variety of fish caught in this parish on the coast, and of an excellent quality, such as haddocks, whittings, flounders of all kinds, roughback, plaice, sole, halibut, turbot, skate, dog and cat fish.'¹¹² He described the species and the seasons when they could be caught, methods of fishing and markets for the fish, with up to 4,000 lobsters sent to London every year. The lobster catch was declining but he noted the abundance of herrings in the Moray Firth where: 'children, sitting on a rock on the shore, and dropping a line with two or three small notched hooks fastened at the end of the line, and pulling it up briskly, caught the herrings by the belly in great numbers, which were sold through the country at a very small price.'¹¹³

In the sea lochs of the west, herring were of the greatest importance. Dugal McDougal listed the catch in Loch Long and Loch Goil and drew particular attention to the herring shoals:

But the fish which is of the greatest general good, in this country, and in every country where it is found in abundance, is herring. There is frequently a good herring fishing, in some one of the three lochs connected with this parish. The herrings generally make their appearance in the months of June and July, and sometimes remain till December or January; and as the lochs in this country are seldom more than a mile broad, and have no swell of sea, nor rapid currents, the boats can go out in the stormiest seasons.¹¹⁴

He noted that there were upwards of 120 boats, and at least 500 men involved in the fishery for more than four months of the year. Thomas Pennant had suggested a cornucopian vision of plenty, when he marvelled at the size of the herring shoals he witnessed at Loch Broom in 1772 and called for development of a herring fishery.¹¹⁵ Youngson's account of the herring fishery noted however that much of the herring catch was traditionally taken by a Dutch fishing fleet, and that a government Act of 1749 had offered a bounty to help establish local fishing businesses.¹¹⁶ The British

¹¹² Peterhead, County of Aberdeen, OSA, vol. XVI, 1795, p. 548.

¹¹³ Peterhead, p. 550.

¹¹⁴ Lochgoil-Head and Kilmorich, County of Argyle, OSA, vol. III, 1792, p. 173.

¹¹⁵ Thomas Pennant, *A Tour of Scotland and Voyage to the Hebrides 1772* (Edinburgh, 1998), pp. 322-325.

¹¹⁶ A. J. Youngson, *After the Forty-Five: The Economic Impact on the Scottish Highlands* (Edinburgh, 1973), pp. 101-109.

Fisheries Society, established in 1786, went further, creating new harbours at Tobermory, Ullapool and Pultneytown (Wick). Some ministers were more measured than Pennant and more cautious than Dugal McDougal in their accounts. While they were aware of the potential bounty of the sea, they were aware that the challenges in managing the fishery were considerable, for example, difficulties in accessing salt to preserve herring were reported by Dugal Campbell at Kilfinichen and Kilviceuen Argyll. The complexity of financing and marketing herring outwith the local area meant that the management of the fisheries was often by outside interests, as described in the parish account of Avoch by James Smith and also noted by Youngson.¹¹⁷ Similarly the account of Loch Broom by Roderick Macrae noted that in Ullapool, profits were being made by businesses in the herring fishery, but with limited benefits to the local community, many of whom remained poor.¹¹⁸ While visitors may have marvelled at the size of the herring shoals, the realities of parish life tempered the judgement of ministers and there is limited evidence of a cornucopian vision of plenty in ministers' accounts.¹¹⁹

Salmon and Seals

Salmon with matches in 412 accounts is mentioned more often than any other fish. It is not clear whether this is because it was of greater financial worth than other fish or that it was of higher status and more noteworthy on this account. Salmon was identified both as a commercial catch and also in its importance for sport fishing, as in Speymouth, where the minister James Gillan reported on the various gamefish in the river: 'All these afford excellent diversion to the angler. But the salmon is the chief object; and of this there is a very valuable fishing on the river, and along the shore near it'.¹²⁰

Commercial salmon fishing was carried out from small boats (cobles) and the salmon caught sent on ice to London. At St. Cyrus, William Walker noted that proprietors of a two mile stretch of the tidal estuary of the river North Esk drew an

¹¹⁷ Kilfinichen and Kilviceuen, County of Argyle, OSA, Vol. XIV, 1795, p 181; Avoch, County of Ross and Cromarty, OSA, Vol. XV, 1795, p. 625.

¹¹⁸ Lochbroom, County of Ross and Cromarty, OSA, Vol. X, 1794, pp. 464-465, 470.

¹¹⁹ A study of attitudes towards scarcity and plenty argues that the seventeenth century cornucopian vision of nature had given way to a more pessimistic assumptions by the end of the eighteenth century; see Fredrik Albritton Jonsson and Carl Wennerlind, *Scarcity: A history from the origins of capitalism to the climate crisis* (Cambridge, MA, 2023).

¹²⁰ Speymouth, County of Elgin, OSA, Vol. XIV, 1795, p. 392.

annual rent of £800 from salmon fishing, a business that employed up to 50 men. He provided a detailed description of the operation of salmon fishing on the estuary and its impact on seals: 'The seals are the greatest enemies of our salmon fishing. They watch the mouth of the river, pursue the salmon as they go up with the flowing tide, and devour many of them.'¹²¹ He recounted a seal hunt in the summer of 1791: 'to destroy these enemies and rivals.' Several gentlemen, farmers and others armed with pikes and muskets attacked the seals in the river and: 'The incumbent saw three of them killed in this manner. The effect has been beneficial to the fishing; for more than twice the quantity of salmon were taken the ensuing season.'

This brutal encounter is indicative of both the interest of the minister in the salmon fishery and his attitude towards the seals. Walker was a minister naturalist who, as noted above, had included a list of plant species in his parish account and, as described in chapter six below, had a keen interest in the geology of the parish. However, he showed no regard for the seal as an animal of interest, just as an enemy of the fishing that had to be destroyed. The culling of seals was also reported by William Sutherland near Wick:

In the season for seal catching, the fishermen as silently as possible, land in boats at the head of the coves, on the beach, where they find numbers of seals, which they kill with bludgeons for their oil. In the egress from there coves, the gradual light of the sun is enjoyed with double satisfaction.¹²²

There is a romantic sensibility in evidence in the minister's appreciation of the gradual light of the sun in the cave but no evidence of any sympathy for the seals; rather the slaughter seems to have enhanced his enjoyment. At Stornoway, Colin McKenzie noted that the seal killing season was around Michaelmas. The hunters landed by boats at the mouth of a cave, where: 'being furnished with fire, they light torches at the entry to the cave, which is dark far in, and they knock to death all the seals found there with heavy bludgeons armed with iron. At first it was not uncommon to see 50 killed at a time; but now the number does not exceed from 7 to 12'.¹²³

¹²¹ St Cyrus, County of Kincardine, OSA, Vol. XI, 1794, p. 94.

¹²² Wick, County of Caithness, OSA, vol. X, 1794, p. 3.

¹²³ Stornoway, County of Ross and Cromarty, OSA, vol. XIX, 1797, p. 257.

The minister recorded the killing without comment and placed it his summary description of the other fauna of the parish. These descriptions of violence seem shocking today but were accepted with equanimity, even enthusiasm, by their authors in the accounts. A minister who was a keen naturalist, such as Walker, approved of slaughter where a species conflicted with human interests.

Whales and Sharks

Whales and dolphins were mentioned in fourteen accounts. The descriptions mention sightings of whales, whale hunting and the economic value of whales, particularly as a source of oil. A whale stranding in a parish was regarded as a potential resource for the community, as described at Unst in Shetland:

Large lean whales are sometimes stranded in the creeks, and sometimes chased ashore by boats. These commonly measure from 60 to 90 feet in length, and are denominated *finners*. The spermaceti whale, a much more valuable prize, sometimes wanders to this coast, and is here entangled and taken.¹²⁴

The basking shark was also a target for hunters as reported at South Uist by George Munro: ‘The sail fish, or basking shark, appears on the coasts of the parish early in the month of May, if the season is warm; he is a stupid and torpid kind of fish; he allows the harpioneer often to feel him with his hand, before he darts at him.’¹²⁵

As with seals, ministers did not appear to demur or to criticise these activities. There is little evidence in the accounts of any concern about the hunting of whales, sharks or seals, even if these activities were carried out with great brutality.

Shellfish

Lobsters appear in twenty two parish accounts and, in common with other species, usually appear in a list of species, as at Oldhamstocks in the county of Haddington, written by John Cochran.

The fish caught on this coast are turbot, cod, skate, herring, haddocks, whittings, flounders, lobsters, and crabs. The lobster fishing begins about the end of October, and continues till the end of April. The fishers are bound by a contract, for a certain number of years, to send them to Dunbar, for the London market, at 5 s. Sterling for sizable lobsters, and half that sum for the undersized ones, per score.¹²⁶

¹²⁴ Unst, County of Shetland, OSA, vol. V, 1793, p. 190.

¹²⁵ South Uist, County of Inverness, OSA, vol. XIII, 1794, p. 296.

¹²⁶ Oldhamstocks, County of Haddington, OSA, vol. VII, 1793, p. 407.

The sale of lobsters repeats the evidence noted elsewhere in the accounts of the importance of London as a market for fish caught in the east coast ports of Scotland. While the lobster might have been sold in London as a luxury item other shellfish, particularly cockles, were the opposite, a source of sustenance for those in poverty in years of hardship, as reported by Edward MacQueen on Barray (Barra):

Shell-fish abound here, such as limpets, muscles, wilks, clams, spout fish, or razor-fish, lobsters, crabs, etc. etc. but what is singularly beneficial to the inhabitants, is the shell fish called cockle. It is found upon the great sand on the N. end of Barray, in such quantities, that in times of great scarcity all the families upon the island (about 200) resort to it for their daily subsistence.¹²⁷

There were similar stories from other coastal parishes, particularly relating to the harvest failure of 1782.¹²⁸

A very small number of ministers expressed interest in the natural history of marine species. One was James Little at Colvend and Southwick in the county of Kirkcudbright who wrote about sea anemones:

There are found upon the shore here some of those wonderful marine productions, which seem to be the links that connect the animal and vegetable systems, viz. the Polypus, called also the Sea Anemone. It does not possess a loco-motive faculty, and its organs are too imperfect to entitle it to be ranked with animals but appears to have somewhat of more sensation than can be ascribed to a merely vegetable substance, like some of which, too, it is reproduced from any part cut off.¹²⁹

He also quoted a neighbouring minister, Muirhead of Urr, that this 'Animal Flower' was as bright and colourful as any found in the waters around Jamaica. 'To see a flower of purple, of green, blue, yellow, etc. striving to catch a worm, is really amusing.'¹³⁰ It is a relief to find one minister for whom sea creatures were objects of interest and not merely of exploitation. The descriptions by ministers of marine life, perhaps more than any other aspect of the natural environment, demonstrate a utilitarian attitude to the exploitation of the natural environment with only a small number of examples of interest in the natural history or aesthetic pleasure of marine life. While ministers were interested and often knowledgeable about the natural environment, their attitudes were very different from those of the twenty first century. This can be

¹²⁷ Barray, County of Inverness, OSA, vol. XIII, 1794, p. 336.

¹²⁸ See for example the accounts for Creich, Tain, Northmaving and Tongue.

¹²⁹ Colvend and Southwick, County of Kirkcudbright, OSA, vol. XVII, 1796, p. 109.

¹³⁰ James Muirhead of Logan, Minister of Urr, quoted in Colvend and Southwick, p110. Muirhead does not mention anemones in his parish account of Urr.

demonstrated further by their attitudes towards species considered by ministers the worst pests, commonly called vermin.

Vermin

One category that is mentioned frequently in the OSA are species that were a nuisance. These could include weeds and scrub, such as furze or bracken, found on waste or poorly managed ground. Pests also included corvids, birds of prey and some mammals such as seals that were annoying to salmon fishermen. The species that were considered the worst threat were called vermin, ‘animals of a noxious or objectionable kind’ and it is worth considering these species for the insights they can give us into ministers’ attitudes towards the natural environment.¹³¹

The term ‘vermin’ is found in twenty eight accounts. These included domestic or agricultural pests such as sheep ticks or intestinal worms, but in some northern parishes the term was sometimes associated with a determined attempt to rid parishes of species. William Gordon of Urquhart referred to stags as vermin: They made ‘a very fine appearance, and afford much pleasure and amusement to the sportsman’ but were: ‘hurtful to plantations and agriculture’. He called for them to be driven out or ‘utterly exterminated’ and called for: ‘gentleman to give small premiums for the destruction of these vermin’¹³² He also referred to other ‘beasts’ and birds of prey in these terms.

Foxes feature prominently in the list of vermin. At Golspie, William Keith devoted two pages to the destruction of foxes noting: ‘much to the honour of this county, upwards of £100 sterling is yearly expended by it for the purpose of extirpating that noxious animal.’ He wrote a detailed account of the scheme, which also applied to eagles, and in which Keith was actively involved as an inspector. He explained the bounties paid to hunters who could produce a dead fox or eagle with a premium paid for killing a pregnant vixen. Eagles were difficult to shoot so a bounty was paid for those trapped using a ‘skainy’ or noose made of twine into which the bird was lured by carrion.¹³³

¹³¹ OED entry for ‘vermin’.

¹³² Urquhart, County of Elgin, OSA, vol. XV, 1795, pp. 99-100.

¹³³ Appendix for Golspie, County of Sutherland, OSA, vol. XXI, 1799, pp. 220-222.

A similar scheme was described by Charles McHardy at Crathie to control: ‘foxes, wild-cats, pole-cats, eagles, hawks, etc.’ The scheme, which covered five parishes, had started in 1776, and continued for a decade. It was paid for by a subscription from heritors amounting to about 40 guineas a year. McHardy recorded that: ‘during that period there were killed 634 foxes, 44 wild-cats, 57 pole-cats; and 70 eagles, 2,520 hawks and kites; 1,347 ravens and hooded crows’. He lamented the demise of the scheme and called for it to be revived across the highlands as a whole.¹³⁴

McHardy was a naturalist who wrote knowledgeably in the account about the mountains, minerals, agriculture and woodlands of the parish, yet he was an enthusiastic supporter of the destruction of pest species.

Foxes, mentioned in 132 accounts, were also subject to much critical comment. In Lochgoil-Head and Kilmorich in Argyll, Dugal McDougal praised the success of a salaried foxhunter: ‘Foxes were formerly very numerous; but since the land has been chiefly stocked with sheep, the distruction of these animals has become an object of great attention.’¹³⁵ In the parish: ‘wild cats are more numerous than foxes, and are also very destructive to lambs.’ However, the wild cats lived in more remote and inaccessible locations and so were more difficult to control. James Thomson at Aberlour included foxes in his list of ‘noxious’ species along with otters and badgers.

¹³⁶ At Kirkmabreck, in Kirkcudbright, Alex Maclean noted that Cairnsmoor was a: ‘receptacle for foxes, which often spread death and destruction far and wide among the surrounding flocks.’¹³⁷ At Cleish in Kinross, William Daling noted the foxes ‘are more destructive to the poultry than to the sheep’.¹³⁸ There was no love lost for such pests in the accounts and little evidence that ministers felt any romantic attraction towards ‘wild’ species, rather they just saw them as a nuisance. A more surprising example was the red squirrel, as described by Henry Sangster in Pencaitland, near Edinburgh:

‘The young woods on the estate of Fountainhall, it has been observed, have of late suffered much from squirrels, which were introduced some years ago at Dalkeith,

¹³⁴ Crathie, County of Aberdeen, OSA, vol. XIV, 1795, pp. 348-350.

¹³⁵ Lochgoil-Head and Kilmorich, p. 176.

¹³⁶ Aberlour, County of Banff, OSA, vol. IV, 1792, pp. 66-67.

¹³⁷ Kirkmabreck, County of Kirkcudbright, OSA, vol. XV, 1795, p. 554.

¹³⁸ Cleish, County of Kinross, OSA, vol. III, 1792.

and have spread to this neighbourhood. They have attacked the Scotch firs in the proportion of about 1 in 20, and, almost every larix and elm.’¹³⁹

The account must refer to the red squirrel as the grey squirrel was not introduced into Scotland until the nineteenth century.¹⁴⁰ The red squirrel was native to Scotland but the lack of tree cover across much of the country meant that it had become quite rare until it was reintroduced by landowners.¹⁴¹ William Torrence, minister at the nearby parish of Glencorse, was ambivalent about the species, noting both its beauty and its damaging habits:

The red squirrel (*sciurus vulgaris rufus* of Linnaeus,) has become extremely common of late years. In this neighbourhood, the woods abound with them, and they are pretty numerous at Woodhouselee. Though a beautiful animal, they are destructive of the small birds, by devouring their eggs, and are extremely injurious to young planting, by cropping and barking the tender shoots. The larch tree suffers particularly from this animal.¹⁴²

The account contained: ‘additions by the Rev. Dr John Walker, Minister of Colington, and Professor of Natural History in the University of Edinburgh’. We cannot be sure who wrote this passage, but the Linnaean details suggest it might have been Walker. Another parish account (Linton) confirms that the reintroduction of the red squirrel was the work of the Duke of Buccleuch at Dalkeith.¹⁴³ While the red squirrel is now protected by legislation as an endangered ‘native’ species, the evidence from the accounts suggests that the attitudes of ministers in the accounts towards the red squirrel were more ambivalent.

Wolves

One species that had been exterminated in Scotland, either by accident or by design, was the wolf. It is interesting that wolves are mentioned in the OSA even though the species had been eliminated at least a century previously.¹⁴⁴ A search for ‘wolf’ produces twelve matches in the accounts and ‘wolves’ fifteen. While some of the

¹³⁹ Pencaitland, County of Haddington, OSA, vol. XVII, 1796, p. 36.

¹⁴⁰ For the later introduction of grey squirrels see Bertolino Sandro, ‘Introduction of the American grey squirrel (*Sciurus carolinensis*) in Europe: a case study in biological invasion’, *Current Science*, vol. 95, (2008), pp. 903-906.

¹⁴¹ Matthew Holmes, ‘The perfect pest: natural history and the red squirrel in nineteenth-century Scotland’, *Archives of Natural History*, vol. 42 (2015), pp. 113-125.

¹⁴² Glencorse, County of Edinburgh, OSA, vol. XV, 1795, pp. 439.

¹⁴³ Linton, County of Peebles, OSA, vol. I, 1791, p. 132.

¹⁴⁴ There is no agreed date for the extinction of the wolf in Scotland but there is an extensive mythology about the killing of the last wolf; see Terry O’Connor and Naomi Sykes (eds.), *Extinctions and Invasions: A Social History of British Fauna* (Oxford, 2010).

entries relate to places or historical figures such as the ‘Wolf of Badenoch’ others throw light on ministers’ interest in this lost species. Some noted that the wolf was a predator that had previously existed in their parishes, while others discussed the killing of the last wolf. One such story was from Kirkmichael in the county of Banff by John Grant: ‘The last said to be killed in this country, was about 150 years ago; yet it is probable that wolves were in Scotland for some time after that period, as the last killed in Ireland was in 1709.’¹⁴⁵ At Kiltarlity the minister suggested that the parish had been previously populated by hunter gatherers and entirely wooded: ‘When the neighbouring low grounds were wholly covered with wood, and infected by the wolf, and British tiger, or wild cat, our progenitors lived by hunting, and by cultivating small portion of the higher grounds.’¹⁴⁶ At Edderachillis, in Sutherland the minister cited the destruction of wolves as an example of ‘improvement’ in the north: ‘It is pleasant to observe the progressive state of civilization in the Highlands of Scotland, and in this place in particular, compared with the ferocity and barbarity of the last century.’ Old round towers in the parish had provided: ‘security from the ravages of wolves, which were numerous and destructive in this country, and where they were not wholly destroyed till of late.’¹⁴⁷

There is one example that struck a different tone. David Dow at Cathcart lamented the loss of species in the parish: ‘The boar, the wolf, and even the deer, to whom these woods proved a defence, are now no more to be found in this country; and it is to be feared, that their more harmless vegetable inhabitants, will also share the same fate.’¹⁴⁸ David Dow was one of the few ministers to express regret at the loss of species and habitats. In this he appears to be ahead of his time and possibly a very early example of a minister interested in conservation. At Blair Atholl James McLagan also noted the association between woodland clearance and vermin, including wolves.

The last century, and the beginning of the present, have destroyed much wood, by fire and otherwise. Places still bear the name of woods, where there is not a tree to

¹⁴⁵ Kirkmichael, County of Banff, OSA, vol. XII, 1794, p. 447.

¹⁴⁶ Kiltarlity, County of Inverness, OSA, vol. XIII, 1794, p. 509.

¹⁴⁷ Edderachillis, County of Sutherland, OSA, vol. VI, 1793, pp. 302-303.

¹⁴⁸ Cathcart, County of Renfrew, OSA, vol. V, 1793, p. 347.

be seen now. The shelter they afforded to wolves, foxes and other vermin, induced people to destroy them; but they did not know when to stop, and went too far.¹⁴⁹

In cutting of the woods ‘going too far’ he suggests that he was uneasy about the balance between controlling vermin and destruction of their habitat. The seeds of later interest in conservation may be seen in these accounts but they are few in number. While the accounts suggest an ambivalent attitude of ministers towards the red squirrel, there is no hint in the accounts of any of interest in reintroducing the wolf. ‘Rewilding’ is a modern concept that, from the evidence of the accounts, would have been alien to ministers.

Conclusion to Chapter six

The purpose of this survey has been to illustrate what ministers were writing about the flora and fauna of their parishes. The first conclusion is that most ministers included some description of species or habitats in their parish accounts and that, collectively, the information contained in the OSA presents a detailed picture of the flora and fauna of Scotland in the 1790s. While we cannot be sure about the naming or correct identification of all species the level of interest of ministers in the flora and fauna of their parishes is not in doubt. Such is the overwhelming level of detail that it has only been possible to present a small selection of examples, with summary tables indicating the species and habitats of greatest interest. While the searches set out in the tables are far from an exact measure they can, with the extracts from the account given above, point to some conclusions. In many cases the authors of the accounts respond to Sinclair’s questionnaire by listing examples of fauna and flora in the parish. In some cases, ministers go on to describe the utility of some species, for example in relation to woodlands. As noted above in chapter three, ministers had studied natural history as part of their university education, and their knowledge is reflected in the quality of many accounts, as is their lived experience as parish ministers.

Three themes have been noted repeatedly in the accounts: interest, utility and threat. Ministers were interested in flora and fauna as the hundreds of descriptions of species and habitats make clear. This interest was usually related to utility: they valued many species for their usefulness, particularly agricultural animals.

¹⁴⁹ Blair-Atholl, County of Perth, OSA, Vol. II, 1792, pp. 465-466.

Descriptions of fish are primarily utilitarian with accounts listing fish caught, their value and how the business of fishing was managed. Similarly with plants, those species and habitats that were useful were often described in most detail. Ministers' interest in oakwoods, for example, was not primarily in the beauty or biodiversity of the woods, but their financial value, with details of their ownership and management. Relatively few species or habitats were mentioned for their interest or beauty alone. Songbirds are one example, which were mentioned by some ministers as a source of joy.

Those species that were a nuisance were described in some detail, as was their control or eradication in some accounts. It is shocking to read about the degree of violence endorsed by ministers towards eagles, hawks or seals and there is little or no evidence among ministers of love for 'ravenous' species. Rather, ministers who were particularly interested and knowledgeable about the natural environment showed little remorse about such violence. Most ministers preferred to see flora and fauna as part of a landscape that was well ordered, productive, beautiful and cleared of vermin.

Chapter Seven: The Physical Environment

The previous chapter discussed ministers' writings on flora and fauna. This chapter explores ministers' descriptions of the physical environment in their parishes, including climate and weather, minerals, fossils, soils and landforms. It begins with a brief introductory section considering the use of scientific terminology and references to scientists in relation to the physical environment in the OSA. It then considers how descriptions of climate and weather throw light on ministers' understanding of the relationship between climate, health, and farming, taking into account the continuing impact of the Little Ice Age in the last quarter of the eighteenth century. Their discussion of minerals, rocks, fossils and landforms can help illuminate ministers' attitudes towards earth history and the possibility that the earth might of great antiquity.

The chapter follows the same approach as the previous chapter, identifying those aspects of the physical environment that were of interest to ministers, summarising the main themes that emerge from the accounts and exploring in more detail the accounts of those ministers who demonstrated a special interest or knowledge of a particular subject. There is an enormous amount of material in the accounts so the approach under most subject headings must necessarily be selective. Here too, search terms have been used to identify subjects of interest to ministers.

As with flora and fauna there are issues of terminology. Subject headings were not mutually exclusive and there is a degree of overlap between them, for example 'minerals' and 'rocks', were terms sometimes used interchangeably as were 'climate' and 'weather'. Similarly, the meaning of some terms has changed so that the term 'fossils' included references to tree stumps in peat bogs, fossil fuel (coal) and to the 'petrifications' of ancient plants and animals. These confusions are addressed in the sections below.

As in the previous chapter much of the writing about the physical environment is utilitarian with great interest in carboniferous geology and enthusiastic endorsement of coal mining. Soils are almost always discussed in relation to their fertility and how this might be improved. There is one significant exception to the utilitarian narrative,

the use of the language to describe beauty in the landscape using terms such as ‘picturesque’, ‘sublime’ or ‘romantic’. As with flora and fauna there were also ministers who were interested in natural history or natural philosophy for its own sake. Such minister naturalists who wrote outstanding accounts are highlighted in the text and discussed in more detail in chapter eight.

Science, Scientists and the Physical Environment in the OSA

A useful starting point in exploring ministers’ interest in the physical environment is to examine the use of scientific terms related to the subject in the OSA. Table 27 sets out a selection of relevant terms, including some identified in tables in chapter six.

Table 27: Scientific terms mentioned in the OSA

Keywords	Number of accounts	Notes
Barometer	15 (<1%)	Mentioned both in relation to weather and to ascertain the height of hills and mountains.
Geology	2 (<1%)	Both references are in the accounts for the Aberdeen universities
Meteorology	4 (<1%)	
Mineralogy	10 (1%)	
Natural History	41 (4%)	Includes mention in the three university accounts
Natural Philosophy	11(1%)	Mainly related to professors and its teaching in universities
Science	56 (5%)	
Scientist	0	
Thermometer	15 (1%)	

‘Science’ is mentioned in fifty six accounts. As noted in chapter two, in the eighteenth century, science was generally understood to mean the systematic study of an environmental or other subject. This is reflected in its usage in the accounts, which was broad and included, for example, both mathematics and ‘moral science’.¹ In some accounts ‘science’ was closely linked to improvement and material wealth, as in the parish of Duns, as described by Robert Bowmaker:

Such has been the spirit of improvement within these last 50 years, that farms in the parish, which were let at £35. and £40, pay now £210, and the tenants doing well. In no country of Great Britain is there a more respectable tenantry, than there is at present in the country of Berwick... men well informed in science, and most intelligent and industrious in their profession; and in every 10 to 15 years, some of

¹ See for example, James Beattie, *Elements of Moral Science* (Edinburgh, 1790).

them are purchasing property of £200, and even £500 a-year; on which they enjoy, the just reward of their attention, labour, diligence, and good sense.²

Bowmaker suggests that material comfort was a respectable reward for the farmers' intelligence and industry which were 'well informed' by science. In Kilmadock, near Stirling, Alexander MacGibbon hoped enlightenment would lead to excellence in arts and sciences, where: 'a spirit of activity is fast spreading among the inhabitants of this district; and when once they are completely awake from their past slumbers, it may be reasonably hoped they will soon excel in arts and sciences'.³ The connection between enlightenment, morality and science was put most simply by James Wilson in Mid Calder: 'It behoves us to rejoice, that we live in happier times, when the darkness of error is fast giving way to the light of reason, truth, and science.'⁴ Science, improvement and enlightenment were closely related in the minds of these ministers.

While science was used in a general sense, the terms 'natural philosophy' and 'natural history' were used to describe investigation of the natural world. The term 'natural history' appeared in fifty six accounts and 'natural philosophy' in forty one, whereas geology was not yet in common usage, with only two mentions, both in university accounts. Mineralogy was mentioned in ten accounts, but (as described below) there were discussions of minerals in more than 200 accounts.

While meteorology is mentioned in only four accounts, the use of barometer and thermometer were both noted in fifteen accounts, suggesting that some ministers were interested in measuring atmospheric changes as a guide to the weather and, in at least one case, Patrick Molleson, to measure the height of hills.⁵ That the terminology of modern science was not used more widely does not imply that ministers were uninterested in science, but rather that the professional disciplines of modern science such as geology or meteorology and their associated language were, in the 1790s, still undeveloped.

² Dunse, County of Berwick, OSA, vol. IV, 1792, p. 383.

³ Kilmadock, County of Perth, OSA, vol. XX, 1798, p. 54.

⁴ Calder Mid, County of Edinburgh, OSA, vol. XIV, 1795, p. 373.

⁵ Walston, County of Lanark, OSA, vol. VII, 1793, p. 117.

The mention of scientists in the OSA was even less common. James Hutton appears only once, in William Crawford's account of Straiton, where he is mentioned in relation to an unusual lacustrine deposit:

On the margin of Loch Doon, there are beds of a very singular soft bluish substance, which, when taken up, and exposed to the sun and atmosphere, becomes white as any fuller's earth, and acquires the consistency of chalk. It has been examined chemically by the celebrated Dr Hutton, who can give the fullest and best account to it⁶

There was no explicit criticism of the *Theory of the Earth* in the accounts nor was there any mention of Archbishop Ussher's estimate of the age of the earth.⁷ Other natural historians mentioned include Buffon in two accounts, Linnaeus in eight and John Lightfoot in six accounts, principally in relation his *Flora Scotica*. Most widely quoted was Thomas Pennant, the natural historian and writer, whose travels are mentioned in forty accounts. Many ministers were interested in the scientific exploration of the physical environment even if they did not necessarily use the terminology of science, and references to scientists were rarely made. The OSA was compiled for practical purposes, to promote good government, rather than for academic purposes and so it is perhaps not surprising that there were few such citations.

Climate and Weather

Climate and weather were of interest to most ministers. The climate of Scotland in the 1790s was significantly cooler than that of the early twenty first century. The 450 years from 1400 to 1850 are sometimes referred to as 'The Little Ice Age'.⁸ While this term has been subject to much scrutiny and debate, evidence from documentary sources and tree ring data show that summer temperatures in Scotland in the eighteenth century were at least one degree Celsius cooler than today.⁹ Throughout the eighteenth century, many parts of Scotland were subject to episodic harsh

⁶ Straiton, County of Ayrshire, OSA, vol. III, 1792, p. 590.

⁷ There are three references to Ussher in the OSA, and all relate to his church history rather than to the age of the earth; for example Cambusnethan, County of Lanark, OSA, vol. XII, 1794, p. 568; Harris, County of Inverness, OSA, vol. X, 1794, p. 376; Campbelton, County of Argyle, OSA, vol. X, 1794, p. 534.

⁸ Brian Fagan, *The Little Ice Age: How Climate Made History, 1300-1850* (New York 2002).

⁹ Miloš Rydval et al. 'Reconstructing 800 years of summer temperatures in Scotland from tree rings', *Climate Dynamics*, vol. 49, (2017), pp. 2951-2974.

winters and harvest failures brought on by cool wet summers.¹⁰ In years of bad weather the risk of crop failure and famine was increased. While none of the years described in the OSA was as severe as ‘the ill years’ at the end of the seventeenth century, harsh winters and famine were recorded in many accounts, for example from the years 1740, 1772 and 1782.¹¹

The summer of 1782 was particularly cold with tree ring analysis revealing it to have been approximately 2.5 degrees Celsius cooler than the 1961-1990 average.¹² This led to late harvests or harvest failure across Scotland often with dire consequences. The harvest failure of 1782 was sufficiently strong in ministers’ memories to be noted in over 100 accounts. As will be seen, for many ministers, climate, farming, food and health were inextricably linked in the accounts.

Table 28: Keywords for climate and weather

Keywords	Number of accounts	Notes
Climate	553 (59%)	
Frost	214 (22%)	
Rain	323 (34%)	
Snow	211 (22%)	Includes a few references to the ‘Snow Kirk’ in Aberdeen
Weather	310 (33%)	Often relates to bad weather

It is not surprising in a cool and wet country that climate and weather should feature so prominently. Over half of all accounts (533) mention ‘climate’ and 310 mention ‘weather’. Rain is mentioned in over a third of accounts, and both snow and frost mentioned in over 200 accounts. There are so many entries under these headings that it is only possible to summarise some of the main themes that emerge. These include the relationship between climate and disease; climate and agriculture; the impact that extreme weather could have on communities; and those minister naturalists who were interested in collecting meteorological information.

¹⁰ An authoritative account is Richard Oram, *Where Men No More May Reap or Sow: The Little Ice Age: Scotland 1400–1850* (Edinburgh, 2024).

¹¹ Karen J. Cullen, *Famine in Scotland: The Ill Years of the 1690s* (Edinburgh, 2010).

¹² Rydval, ‘Reconstructing 800 years of summer temperatures’, p. 2960.

Climate and Disease

In many accounts climate and disease are discussed together. For example, in Airlie, in the county of Forfar, James Stormonth linked together the situation of the parish, its climate and diseases:

The parish may be divided into 2 districts. About two thirds of it lie in Strathmore, and the other forms the higher ground, which seems to terminate the strath on the N. In the former the climate is mildest; but the air is most pure and healthy in the latter, and freest from the fogs. Rheumatisms, slow fevers, and sometimes agues prevail, especially in the neighbourhood of the mossy and swampy ground.¹³

On the edge of the highlands, at Aberfoyle, the cold air and heavy rainfall brought its own health challenges according to Patrick Graham:

The air is sharp and healthy. This neighbourhood is seldom visited by any epidemical disorders. Fevers are the most frequent diseases; they are to be attributed to the natives being much exposed to getting wet, in a climate where, from the mountainous nature of the country, rains are frequent.¹⁴

Patrick Graham understood the relationship between relief and rainfall and the deleterious effect of heavy rainfall on outdoor activities. At Tullieallan, in the county of Perth, David Simson suggested that the climate was influenced for the better by close proximity of the river: 'Surrounded by the river Forth on the S. W., exposed to a free current of air in this direction, and well sheltered by the elevation of the ground, and the adjacent woods on the N. and E., this parish possesses, at all seasons, a more mild and temperate climate than many other parts of Scotland, in the same latitude.'¹⁵ At Errol, also in the county of Perth, William Herdman, assistant minister, noted the effect of land drainage on health:

The whole country is naturally wet, and it is the draining and improving of it within these last 50 years, which has contributed so much to its value and fertility. The climate, of course, could not be considered as the most desirable. It was damp, and attended with such diseases as are common in a heavy atmosphere. Some time ago, the ague was a very prevalent complaint; it has now in a great measure disappeared.¹⁶

Herdman described the beneficial effect of drainage for agricultural productivity and human health. Ague, possibly meaning malaria, was reduced through the draining of

¹³ Airlie, County of Forfar, OSA, vol. XI, 1794, p. 208.

¹⁴ Aberfoyle, County of Perth, OSA, Vol. X, 1794, p. 120.

¹⁵ Tulliallan, County of Perth, OSA, vol. XI, 1794, p. 547.

¹⁶ Errol, County of Perth, OSA, vol. IV, 1792, p. 480.

wetlands and the reduction in population of mosquitoes.¹⁷ There were many other comments about the consequences of dampness in low lying situations, for example from Adam Murray at Eccles in the lower Tweed valley:

The climate of Eccles, from its low and flat situation, is by no means the most healthy; and from the marsh miasma, (arising from rain water stagnating on the surface of a soil, chiefly clay), the people are peculiarly obnoxious to diseases of debility, such as agues, nervous fevers, chronic rheumatisms, &c.¹⁸

He explained that the impact of such diseases had been reduced, in part, due to drainage but also because of better housing, diet and clothing. He understood that those parishioners living in poverty were more susceptible to disease: 'That the influence of a damp climate is corrected by a generous mode of living, is abundantly evident from this circumstance, that while the poorer sort are often visited by the abovementioned diseases, the gentry and opulent farmers almost always escape.'¹⁹

The miasmatic theory of health is implicit several accounts, associating ill health with noxious emissions from stagnant water.²⁰ At Dryfesdale (Lockerbie), in the county of Dumfries, Thomas Henderson reported that 'the air is dry and healthy, because the country has a fine open exposure to the S. and W'.²¹ Samuel Smith at Borgue, near Kirkcudbright, discussed miasmas in some detail, questioning the simple relationship between drainage and disease: 'Marsh Miasma is assigned as the remote cause of intermittent fevers; and when such diseases become less prevalent, it is very natural to suppose, that the draining of marshes or mosses must be the occasion of it.'²² He went on to note that there had been no such drainage in the parish for several years but that the incidence of ague had still diminished. In a complicated argument, he suggested that crops absorbed harmful air, reducing the risk to humans, quoting Lavoisier: 'Moreover, it has been proved by Lavoisier and others, that water contains pure air and inflammable air: and also, that inflammable and bad

¹⁷ T. Chin and P.D. Welsby, 'Malaria in the UK: past, present, and future', *Postgraduate Medical Journal*, vol. 80 (2004), pp. 663-666.

¹⁸ Eccles, County of Berwick, OSA, vol. XI, 1794, p. 234. 'Obnoxious' in the text may be an error or may mean 'susceptible'.

¹⁹ Eccles, p. 234.

²⁰ There is a substantial literature on the history of miasmatic theory which can be traced back to classical sources. For a brief introduction see Carl. S. Sterner 'A brief history of miasmatic theory', *Bulletin of the History of Medicine*, vol. 22 (2007), pp. 747-754.

²¹ Dryfesdale, County of Dumfries, OSA, vol. IX, 1793, p. 420.

²² Borgue, County of Kirkcudbright, OSA, vol. XI, 1794, p. 34.

airs are in a great measure the food of plants.’²³ ‘Flammable air’ refers to oxygen, one of the principal discoveries of Lavoisier. Smith concluded that: ‘cultivation of the ground will in various ways contribute to remove the cause of agues, and other febrile diseases; and be of great use, in producing that state of the air which is favourable for promoting general health.’ Smith’s argument was ingenious and points to an interest in environmental health. He was also open to further debate: ‘These remarks, however, it is hoped may be useful, to excite farther inquiry into a matter, which is so peculiarly interesting.’²⁴ Smith (1757-1816), educated at Edinburgh University was also a farmer noted for his: ‘deliberate speech, acute observation, independent thinking, extensive information, and liberal sentiments’.²⁵ He was the author of the *General View of the Agriculture of Galloway* and an example of an enlightenment minister actively involved in improvement. In quoting Lavoisier he was also well informed about contemporary scientific developments.²⁶

It is striking how many ministers described the health impacts of microclimates within parishes, distinguishing between well-ventilated and healthy localities and unhealthy, swampy or misty areas. The accounts also suggest how the medical implications of climate could be alleviated by agricultural ‘improvement’ such as land drainage or other means. Improvement as a concept therefore had a wider meaning for ministers than just agricultural productivity, it could also include improvements in public health.

Climate and Agriculture

The descriptions of climate and agriculture in the OSA often describe the constraints imposed by the climate, particularly in the west and the north of Scotland. For example, in Kilninver and Kilmelfort on the west coast, Patick Campbell reported on the frustrations of the uncertain climate:

A rainy stormy climate; autumn floods and equinoctial storms, which often frustrate the labours of the industrious farmer; and what is a greater discouragement, he who raises the best and most luxuriant crop, is sure to suffer

²³ Borgue, p. 34.

²⁴ Borgue, p. 35. Lavoisier was executed by guillotine in May 1794, presumably after this account was written. A useful introduction to his work can be found in James J. Bohning *The Chemical Revolution of Antoine-Laurent Lavoisier*, (Washington D.C., 1999).

²⁵ Fasti. Vol. II, p. 396.

²⁶ Samuel Smith, *General View of the Agriculture of Galloway* (Edinburgh, 1810).

most from the climate. Only early and green crops can be cultivated to any advantage in such a climate.²⁷

In upland Lanarkshire, at Carmichael, Robert Inglis noted the same problem:

The climate and soil continue great discouragements to the exertions of the farmer. For after much expense and soil, by one night's frost, or a continuance of rainy weather in harvest, his hopes are often disappointed, and he seldom knows what it is completely to save a fully ripened crop.²⁸

In Assynt in the northern highlands William Mackenzie wrote a detailed account of the weather and its impact on farming in which he suggested the parish was one of the wettest in the northwest: 'The rain continues not only for hours, but often for days; nay, for weeks, especially if the wind perseveres for so long a time to blow from the west.'²⁹ The impact of prolonged rain in Assynt was to delay or damage the harvest which, in the worst years, had serious implications:

If the harvest be a good one, the crop will be secured by the latter end of September; but this happens very seldom, by reason of excessive rains, which, if they come on in March, lengthen the labouring to the 24th of June, and of course very probably the ingathering of the crop is protracted to the end of October at least, if not, to the middle of November. If these rains continue, and change to sleet and frost, which sometimes happens, the whole labour of the year is either lost, or, the crop is rendered unwholesome for man and beast; of consequences sickness prevails among the people, and the loss of cattle is inevitable.³⁰

Mackenzie recalled two of the worst harvests that he had witnessed during his tenure. One was in 1772, when one third of the cattle of the parish died, and the other in 1782 when the harvest was mostly lost 'being covered with snow' and he concluded his account with a premonition. 'At this very time 12 September 1793, the barley is not put down, therefore a very late harvest is dreaded.'³¹

Other ministers recalled the harvest failure in 1782, including Walter Jardine at Bathgate, who devoted half a page to its consequences, and Bryce Johnston at Holywood near Dumfries.³² Johnston recorded that snow and frost interrupted the harvest:

²⁷ Kilninver and Kilmelfort, County of Argyle, OSA, vol. X, 1794, p. 324.

²⁸ Carmichael, County of Lanark, OSA, vol. XIII, 1794, p. 369.

²⁹ Assynt, County of Sutherland, OSA, vol. XVI, 1795, p. 188.

³⁰ Assynt, p. 188.

³¹ Assynt, p. 188.

³² Bathgate, County of Linlithgow, OSA, vol. I, 1791, p. 353; Holywood, County of Dumfries, OSA, vol. I, 1791, p. 35.

The harvests of 1782, and 1783, were very late, especially that of 1782. Before the corn was all cut in this part of the country, there were intense frosts and heavy snows. On the 2d of November 1782, in particular, a very heavy fall of snow covered the corn so deep, and lay so long, that they could not be cut for several days after.³³

These few extracts show ministers were acutely aware of the impact of climate on their parishes. As Oram has pointed out, agricultural improvement in Scotland took place in the eighteenth century against the background of the Little Ice Age, and developed despite the harsh conditions rather than because of any amelioration in the climate.³⁴

If discussions of climate were often linked to environmental health and farming, the term ‘weather’ was often used to mean bad weather and the difficulties it created for travel. The minister for the small isles (Eigg, Rum, Muck and Canna) Donald McLean described the roads as ‘almost in a state of nature’. ‘There is not a bridge in the whole parish, yet it is obvious, that small ones are absolutely necessary in Eigg and Rum, as several of our waters become often dangerous, and even impassible, by heavy falls of rains and melting of snow.’³⁵ Similarly in Perthshire at Kilmadock, Alexander MacGibbon reported that only two roads through Doune were passable after heavy rain:

Except these two roads, there are no other roads, public or private, in the parish, passable in bad weather. The public are equally ill supplied with bridges, though, it is evident, from the preceding description of the rivers and burns, that communication must be much obstructed in time of floods.³⁶

Such comments on the lack of roads and bridges, point to the restrictions on travel created by bad weather.

Coastal parishes feature prominently in these descriptions. John McLiesh at Kilchoman on Islay noted that the new harbour constructed at Bowmore had done much to protect shipping from Atlantic storms, while Andrew Bell at Crail in Fife, and James Greig at Pitsligo in Moray, both called for new harbours to protect against the

³³ Holywood, p. 35.

³⁴ Richard D. Oram, *Little Ice Age* (Edinburgh 2024), chap. 9, ‘Achieving Improvement amid a ‘Sea of Waste’: Agricultural Change to 1790’.

³⁵ Small Isles, County of Inverness, OSA, vol. XVII, 1796, p. 292.

³⁶ Kilmadock, County of Perth, OSA, vol. XX, 1798, p. 50.

weather.³⁷ In North Uist Allan MacQueen reported that the Atlantic coast of the island was inaccessible to all vessels for prolonged periods.³⁸ At Delting in Shetland John Morison described the terrible consequences of bad weather:

The fishery is carried on in these open boats, at the distance of 10 or 15 leagues from shore; and when bad weather overtakes them during the night, which is often the case, the poor men are obliged to desert their lines, and make for the shore, which, alas! in many instances they never reach. The present minister remembers two boats being lost in one night, by which accident 10 widows and 53 fatherless children were left.³⁹

Ministers recorded the impact of bad weather on farming and fishing, and in these accounts called for new roads, bridges and harbours to alleviate the problem. While the ideology of improvement is most usually associated with agriculture these accounts indicate that it could be applied to physical infrastructure as well.

Recording the Weather

A few ministers mentioned instruments for measuring the weather, particularly thermometers and barometers, which were becoming more widely available in the late eighteenth century.⁴⁰ Ministers were not alone in this endeavour. As Jan Golinski has shown, taking meteorological observations and recording them was part of the culture of eighteenth century amateur science.⁴¹ Among the ministers who referred to meteorological observations were George Low in the Orkney parish of Birsay and Harray, who noted that he had seen: ‘the thermometer down at 24; at which time, what we call strong beer, was frozen, while small beer broke the bottles by bursting.’⁴² A small number of ministers kept records of the weather, including Thomas Robertson of Selkirk, who included a brief summary of his observations:

By a regular attention to the pluviometer, barometer and Fahrenheit's thermometer, for ten years, the mean quantity of rain yearly is 31 1/2 inches. The

³⁷ Kilchoman, County of Argyle, OSA, vol. XI, 1794, p. 276; Crail, County of Fife, OSA, vol. IX, 1793, p. 456; Pitsligo, County of Aberdeen, OSA, vol. V, 1793, p. 105.

³⁸ North Uist, County of Inverness, OSA, vol. XIII, 1794, p. 302.

³⁹ Delting, County of Shetland, OSA, vol. I, 1791, p. 388.

⁴⁰ W.E. Knowles Middleton, *A history of the thermometer and its use in meteorology* (Baltimore, 1966). James Hutton made an important contribution to weather recording with the development of the ‘wet dry thermometer’, see Alan Werritty, ‘James Hutton and the measurement of atmospheric moisture’, *Notes and Records of the Royal Society*, vol. 79 (2024), pp. 87-98.

⁴¹ Jan Golinski, *British Weather and the Climate of Enlightenment* (Chicago, 2007), pp 77-91.

⁴² Birsay and Harray, County of Orkney, OSA, vol. XIV, 1795, p. 313.

medium height of the barometer 29 1/2. The medium of heat 43 degrees. Nor did the medium of heat differ one degree during these ten years.⁴³

Robert Small in Dundee reported details of rainfall and temperatures made near the town in the preceding decade:

From a meteorological register, kept for some years past, by Mr. Fairweather, a gentleman in the neighbourhood of the town, it appears, that the annual average of rain, which fell from January 1783, to January 1792, is 22 inches, or abstracting from the uncommonly rainy year of 1789, 21, that the average height of Fahrenheit's thermometer, for the months of June, July, and August, at two o'clock afternoon, was for the same years 63, and for the months of December, January, and February, at 8 in the morning 34. The house, where this register was kept, is situated in the south exposure of the bank below Blackness, and about 40 feet above the level of the Tay.⁴⁴

Small, who was a mathematician and Fellow of the RSE, was at pains to provide accurate data, noting the location and elevation at which the observations were made. William Inerarity at Caputh in Perthshire took readings of temperature in the parish every evening at 11pm and provided monthly high and low figures for the decade from 1783.⁴⁵ He also included a comparison with figures collected in Edinburgh and set out the data in a table in the account, reproduced in figure 6, an impressive dataset collected by an amateur meteorologist.

⁴³ Selkirk, County of Selkirk, OSA, vol. II, 1792, p. 438.

⁴⁴ Dundee, County of Forfar, OSA, vol. VIII, 1793, p. 202.

⁴⁵ Caputh, County of Perth, OSA, vol. IX, 1793, p. 489.

ABSTRACT of the STATE of the THERMOMETER at DELVIN for 10 Years.

	1783.		1784.		1785.		1786.		1787.		1788.		1789.		1790.		1791.		1792.	
	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.	Great height.	Least height.
January	46	25	41	12	48	18	50	13	50	28	50	25	46	15	46	29	49	29	43	21
February	49	20	40	23	42	18	45	21	48	31	43	29	48	31	49	33	46	29	48	28
March	47	22			48	20	45	19	48	29	47	21	37	24	49	32	48	28	46	21
April	53	37			55	28	52	30	48	34	51	34	48	31	46	30	48	34	51	30
May	54	36	56	41	54	38	55	37	52	40	60	35	52	37	56	40	53	38	51	38
June	56	47	56	41	67	44	61	46	57	35	55	47	56	43	57	42	60	37	56	43
July	64	51	57	47	64	50	59	44	67	47	60	46	56	48	60	48	58	50	62	48
August	66	48	60	43	59	41	59	46	60	49	63	48	60	48	61	46	60	42	60	40
September	58	42	60	40	60	38	53	41	64	40	58	44	58	40	55	40	58	36	57	36
October	57	34	49	30	56	28	55	32	52	33	55	35	55	31	54	31	56	32	53	32
November	49	31	47	24	49	27	45	27	48	21	50	31	46	29	46	22	48	30	56	30
December	47	10	52	19	43	22	45	24	51	18	44	8	48	32	48	23	39	17	52	26

Abstract of the State of the Thermometer in Queen-street, Edinburgh, for 10 Years.

January	48	21	48	17	47	24	52	17	51	30	48	26	52	23	49	34	47	31	47	20
February	51	25	47	21	39	20	47	25	48	32	45	28	49	34	51	36	46	26	50	33
March	49	26	42	26	42	21	44	23	48	34	49	22	40	28	52	37	48	30	49	27
April	55	37	45	32	56	27	57	32	49	34	59	34	51	32	48	35	50	37	52	35
May	55	38	56	42	50	36			57	41	67	42	59	39	52	44	55	37	52	39
June	67	39	58	46	71	43			58	36	61	49	57	46			62	36	58	47
July	67	51	59	48	65	52	61	48	60	48	62	51	59	49	50	46	63	49	61	49
August	64	49	61	46	60	48	61	48	61	48			64	52	62	48	63	50	64	40
September	58	44	59	41	62	37	56	37	58	43			59	44	55	43			56	39
October	59	35	48	30	58	29	57	34	53	41	54	47	57	36	59	40	55	38	53	37
November	53	31	49	25	51	29	46	31	49	28	55	32	48	34	49	31	52	33	56	31
December	48	11	84	21	45	18	51	20	54	29	43	26	51	33	48	28	41	19	51	29

The minister measured the maximum and minimum temperatures recorded at 11pm each night in each month from 1783 to 1791 at Delvin in the parish of Caputh using 'Fahrenheit's thermometer' to which he added comparative data from Queen Street in Edinburgh. Monthly data is missing for March and April 1784 (Delvin) and there are several gaps in the Edinburgh data.⁴⁶

Figure 6: William Inerarity's record of temperatures

Also in Perthshire, at Bendochy, James Playfair described in detail the weather and the seasons. He compared the character of the winds from different points of the compass: 'The E. wind is accompanied with rain; but in spring it is sometimes dry. The S. wind is a wet wind, and seldom blows. The S. W. wind, which blows in the direction of the strath, is the most common of all others.'⁴⁷ Among the other observations he noted was the insulating power of snow:

⁴⁶ Caputh, p. 489.

⁴⁷ Bendochy, County of Perth, OSA, vol. XIX, 1797, p. 364.

A great fall of snow in winter seems to change the climate above it from the time of its fall, while it continues upon the ground. It prevents the cold of the atmosphere from descending to the earth, and the heat of the earth from ascending to the atmosphere. Ground that is not frozen when the snow falls on it, will not freeze after.⁴⁸

He included a brief description of the cold winter of 1794-1795, remarking that in December 1794 there had been an exceptional twenty three degrees of frost and that snow continued from January to March 1795:

March 11, the river ice broke, and went down; March 19. Wreaths still in hollows; Sidlaw hills still continued white; March 23. ploughs going; March 31. rain and flood; April 4. sowing; April 15. snow nearly off Sidlaw hills; May 9. snowing; thermometer about 48 all May; all summer below 60 except a day or two.⁴⁹

Another James Playfair, also a minister, wrote the account for the nearby parish of Meigle in which he included a table of 'the mean heights of the thermometer and barometer, weather etc. at Balemont Castle'.⁵⁰ It is likely that the data was provided by the resident landowner, James Stuart-Mackenzie (1718-1800), an amateur astronomer, agricultural improver and an early member of the Royal Society of Edinburgh.⁵¹

Of the ministers who expressed interest in meteorology, James Meek of Cambuslang is the most significant. In his account he inserted an: 'abridgment of a register, kept for seven years, (from 1st January 1785, to 31st December 1791,) at Cambuslang manse, which is situated about 200 feet above the level of the sea.'⁵² The account included a table with summary information on barometric pressure, temperatures, wind direction and number of days with rain. Meek reported that the table was the product of meticulous record keeping. 'The Barometer was every day marked at 8 o'clock in the morning, and 10 o'clock at night; and the Thermometer, not only at these times, but also at 2 o'clock afternoon; so that columns first and fourth, express the mean height between these extremes of the day.'⁵³ The account is the only known publication of Meek's data in his own lifetime but he continued to make observations

⁴⁸ Bendochy, p. 364.

⁴⁹ Bendochy, p. 365.

⁵⁰ Appendix for Meigle, County of Perth, OSA, Vol. XXI, 1799, p. 58-59.

⁵¹ Entry for James Stuart-Mackenzie in ODNB.

⁵² Cambuslang, County of Lanark, OSA, vol. V, 1793, p. 245.

⁵³ Cambuslang, p. 246.

until 1809, collating the data into a manuscript that is now held in Glasgow University Library.⁵⁴ Further details of his work are included in chapter seven.

As noted by Golinski, growing interest in weather and climate was a feature of the scientific culture of the enlightenment.⁵⁵ Ministers writing in the OSA reflect this wider culture. Weather and climate were subjects of widespread interest to ministers with implications for human health, agriculture and travel, all subjects covered in the accounts. It is clear that bad weather could lead to harvest failure, hunger and the risk of starvation, particularly in parishes in the north and west. Ministers were also aware of the importance of microclimates and how they could have health impacts in different parts of the parish. The importance of microclimates and the local patterns of ill health appeared to many ministers to support a miasmatic theory of ill health, although some ministers were aware that poverty and ill health were connected. In the descriptions of weather and climate the ideology of improvement is often repeated, in relation to improving health, roads and bridges and harbours or in providing useful information for farmers and others. This can be described as an example of ‘practical enlightenment’. A few ministers were actively using barometers and thermometers to record the weather. Their meticulous and systematic recording of the weather is an impressive display of interest in a new, quantitative, science.

Soils

An astonishing 857 accounts (91%) mention the soil or soils of the parish, a proportion unmatched by any other environmental subject. The ubiquity of descriptions of the soil point to its importance to ministers and to the lives and wellbeing of those who lived in their parishes. Scotland in 1790 remained a largely rural country where the availability of food and the avoidance of malnutrition was dependent on the success of agriculture.⁵⁶ Descriptions of soil came from all parts of the country. In the rich farmlands of the southeast, the accounts were generally positive, for example Laurence Johnston at Earlston in Berwickshire: ‘The soil is not all the same; some parts of it are clay, others a light dry soil, and other parts are a

⁵⁴ James Meek, ‘Journal and register of the weather kept at Cambuslang 1785-1809’, MS held in Glasgow University Library special collections, reference: GB 247 MS Gen 325/1.

⁵⁵ Golinski, *British Weather*, pp 1-12.

⁵⁶ The national impact of harvest failure has been discussed by Philipp Rössner, ‘The 1738–41 harvest crisis in Scotland’, *Scottish Historical Review*, vol. 90 (2011), pp. 27-63.

desirable mixture of both.’⁵⁷ At nearby Eccles Adam Murray was equally positive: ‘The soil is in general good, and consists of various kinds; loam, gravel, and deep clay. The clay soil is most prevalent; and as there is a considerable mixture of sand in it, when it is properly cultivated, and proper manure applied, it bears very luxuriant crops of every kind.’⁵⁸ As with climate these descriptions demonstrate that ministers were sensitive to variations in soil quality within the parish.

In the uplands of the north and the west conditions were not always so favourable. For example, at Douglas in the hills of Lanarkshire William McCubbin drew attention to the difference between river alluvium and the hillslopes above it: ‘The soil is variable, except the holms, which being a new soil formed by the river, is pretty uniform; but the ground on either side is very spouty, occasioned in some places by the outburst, of the coal and other minerals; but in most places by the bottom being a cold wet till.’⁵⁹ At Keithhall in the county of Aberdeen, George Skene Keith noted the variety in soil quality across the parish:

The soil varies considerably. The western part, having a fertile soil, produces good crops: But the eastern is, in general, very unfruitful. This is partly owing to its exposure to the E. the N. and N.E. partly to the poorness of the soil, and coldness of the subsoil, and no doubt, also partly to its elevation, many of the fields being 350 feet above the level of the sea.⁶⁰

On the islands the soils could be very infertile. John MacLeod wrote a sympathetic but pessimistic account of the challenges facing the population on Harris: ‘Harris can never be enriched by agriculture. The soils now in culture are, generally speaking, poor; and of the waste lands the far greater part will entirely baffle the art of the husbandman for ever.’⁶¹ He took care to distinguish between the different types of soil across the island, between the machair of the west and the inland peat soils:

Of all these lands the soil is in general sandy; that especially which lies nearest the shore, from whence the sand is perpetually drifted by high winds, is pure shell, ground very fine, in which the eye can scarcely discern a particle of earth. Towards the latter end of spring it gets, a strong surface; and, when ploughed without

⁵⁷ Earlston, County of Berwick, OSA, vol. IV, 1792, p. 248.

⁵⁸ Eccles, County of Berwick, OSA, vol. XI, 1794, p. 230.

⁵⁹ Douglas, County of Lanark, OSA, vol. VIII, 1793, p. 77. ‘Spout’ means spring.

⁶⁰ Keithhall, County of Aberdeen, OSA, vol. II, 1792, p. 528.

⁶¹ Harris, County of Inverness, OSA, vol. X, 1794, p. 350.

manure, it yields a thin crop of small black oats, the stalks of which seldom rise above a foot from the ground.⁶²

Away from the Atlantic coast the surface of the island was mainly rock or acid peat. 'The soil most prevalent in Harris is a kind of black earth, of firm cohesion, with a strong surface, which is thin over the rocks, and on the declivities, but very deep and much of the nature of moss, in the low and swampy grounds.'⁶³ There were a few pockets of good soil that could be improved:

There is upon two farms, called Rowdale and Strond, at the S. extremity of the mainland of Harris, a red loamy soil, by far the richest in the parish, which has not yet been brought to that degree of cultivation it might admit of. It is tilled in lazy-beds; but if drained and cleared of stones, which is by no means impracticable, the greatest part of it might be turned with the plough.⁶⁴

Harris is an extreme example, with a harsh climate and a substrate of Lewisian gneiss that tends to produce acid and infertile soils, but across the highlands and islands there were other challenging soils noted by ministers. At Birsay on Orkney, George Low recorded that: 'The soil is very various in the barony of Birsay; the N. side in general is shallow, it being a mixture of clay and thin sand, in some places having a thin bottom of rock; some parts of the upper end of the N. side having tolerable black ground, but rather wettish; S. side, good sandy ground, but generally produces the steadiest crops, except when the sea bleaches it.'⁶⁵ In the east, in Forfar, the soil was better but not without challenges, as described by John Gellatly in the parish of Tealing:

The cultivated part of the parish forms a plain gently declining towards the S.; of a soil light and gravelly towards the hill, rather fitter for pasture than tillage, black, deep and rich, sometimes including clay in the middle; in the southern parts rather marshy, and mostly used as pasture, or natural meadow. The great fault of the soil in general is an excess of moisture, owing partly to the vicinity of the hill, but chiefly to a stratum of clay, or rather clay and gravel, which runs immediately under the whole of it.⁶⁶

The level of detail in these accounts is impressive. The ministers quoted here were familiar with the variety and quality of soils and what made soils productive or sterile.

⁶² Harris, p. 350.

⁶³ Harris, p. 351.

⁶⁴ Harris, p. 351.

⁶⁵ Birsay and Harray, County of Orkney, OSA, Vol. XIV, 1795, p. 312.

⁶⁶ Tealing, County of Forfar, OSA, Vol. IV, 1792, p. 93.

The clay and gravel described by Tealing are typical of the glacial deposits or 'till' that cover much of lowland Scotland and many ministers commented on how such soils might be improved. Effective management of soil fertility was vital to agricultural improvement and is described in detail in many accounts. At Garvald and Baro in the county of Haddington Andrew Nisbet recorded the application of lime:

Lime brought from the distance of 4 or 5 miles is extensively used, and proves an excellent stimulus. Turnips, as they are always raised with dung, and frequently cleaned, have a surprising effect in meliorating and enriching the soil.⁶⁷

The application of lime was one way of improving soil fertility. Ministers may also have been aware of the guidance given by writers on agriculture such as James Anderson, who advised farmers on methods to determine the quality of lime available locally, using simple experiments that could be conducted on the farm.⁶⁸

Some ministers felt confident in sharing advice on improving soils. John Brymer, of Marykirk in the Mearns of Kincardine, described the great variety of soils that appeared in the parish: 'not only in the same farm, but in the same field' and how they required individual attention and different crops to fulfil their potential. Among the most challenging soils to manage he suggested were those: 'so unpleasant, so tough and clayey' that 'much ploughing and draining, sand and lime, and a compost of dung' were necessary to make them productive. He wrote about an appropriate course of action: 'In preparing for any crop that has a soil with a wet bottom, they think it necessary to drain it by every possible means; so that any water issuing from the ground, or rainwater on the surface, may gently run off with the least damage to the soil or manure.'⁶⁹ That such detailed descriptions of the soil were written by church ministers suggests that they were confident of their knowledge and happy to give advice.

An example of a minister acting as agricultural adviser was at West Kilbride, by the Clyde estuary. Here Arthur Oughterson lamented the poor state of farming he had

⁶⁷ Garvald and Bara, County of Haddington, OSA, Vol. XIII, 1794, p. 355.

⁶⁸ Matthew D. Eddy, 'The Aberdeen Agricola: Chemical Principles and Practice in James Anderson's *Georgics and Geology*', in *New Narratives in Eighteenth-Century Chemistry* (Dordrecht, 2007), pp. 139-156.

⁶⁹ Marykirk, County of Kincardine, OSA, Vol. XVIII, 1796, p. 623.

found upon his arrival in the parish and devoted three pages to how soils might be improved. He commented:

The 3 following soils are the most common: A very light, dry, sandy soil, with a mixture of good earth; the mossy; and a strong tilly clay. These different soils, point out to the intelligent farmers, what method of cultivation they would require. It is agreed, that compost of dung, earth, and lime, would suit the first mentioned soil; and that when laid down richly, it would produce excellent crops of clover and other grasses; yet this hath never been sufficiently tried: and until of late years, the farmers in this part of the country, who had adopted the very worst practice of the old husbandry, remained utterly unacquainted with the method of laying down land in this manner.⁷⁰

West Kilbride is a coastal parish where seaweed had been used as a manure but due to the 'prejudices of the people' little lime: 'When the present incumbent entered to his charge, there was not an ounce of lime laid upon land within the parish, and no reasoning could prevail with the farmers to try it: they pleaded their ignorance of its operation, the method of applying it, and the great expense attending the conveyance of it from a distant kiln.'⁷¹ The confidence, or even arrogance, of the minister towards the farmers in the parish is striking. Oughterson had come to the parish with clear ideas about the importance of improvement, including the application of lime. The traditional practices of using seaweed in coastal parishes, which may have been effective, he dismissed as ignorant.

Agricultural improvement and soil management were inextricably linked, and ministers' enthusiasm for good soil management is in evidence throughout the OSA. Ministers may have disagreed with each other profoundly over issues such as patronage in the appointment of ministers or on questions of theology, but it is difficult to find any minister who deviated from a belief in agricultural improvement through better soil management. Christopher Smout has highlighted the role of ministers in promoting agricultural change and Sir John Sinclair engaged the services of several ministers to write county surveys of agriculture.⁷² Ministers were also respected authors of agricultural textbooks. Heather Holmes noted that these included William Thom, minister at Govan; Adam Dickson, of Duns and

⁷⁰ West Kilbride, County of Ayrshire, OSA, vol. XII, 1794, p. 407.

⁷¹ West Kilbride, p. 408

⁷² Christopher Smout, 'A new look at the Scottish Improvers', *Scottish Historical Review*, vol. 91 (2012), pp. 125-149.

Whittinghame; and William Barron of Whitburn, West Lothian.⁷³ The accounts highlight ministers' great interest in the soil and their commitment to improvement.

Minerals

This section examines descriptions of minerals in the OSA, including iron, lead and, above all, coal. Minerals were of interest as part of the natural history of the parish, but the accounts also include many descriptions of attempts to exploit minerals for agriculture or industry. The accounts also offer examples of the environmental impacts that were a consequence of the extraction and processing of minerals.

Table 29: Minerals

Keywords	Number of accounts	Notes
Minerals	364 (38%)	Includes references to mineral waters.
Coal	659 (70%)	
Iron	296 (31%)	Includes references to iron tools used in farming

Well over a third of the accounts mention minerals. Searches for some individual minerals are misleading and have been excluded. For example, many references to 'gold' and 'silver' in the accounts relate to coinage or jewellery, and 'lead' refers to the verb more often than the metal. Searches for coal and iron are more reliable and the number of accounts that mention them suggests their importance, both their economic importance and their natural history.

At their simplest, accounts list minerals in the parish, such as at St Martin's in the county of Perth where David Bannerman was dismissive: 'There are no hills of any note here; nor are there any minerals worth mentioning, except limestone and rock marl, near the banks of the Tay. Freestone quarries are found almost every where through the parish.'⁷⁴ James Cooper at Baldernock, in the county of Stirling was more positive, affirming: 'This parish abounds in coal and limestone.' He described the mining of coal and quarrying of limestone, the existence of an 'abundance of freestone of a good quality for building, and a little iron-stone.'⁷⁵ He also noticed another potential resource: 'A small rivulet in the East end of the parish makes a very plentiful deposition of ochre, which, if proper means were used to collect it, might

⁷³ Heather Holmes, 'The circulation of Scottish agricultural books during the eighteenth century', *Agricultural History Review*, vol. 54 (2006), pp. 45-78.

⁷⁴ St Martins, County of Perth, OSA, vol. XIII, 1794, p. 501.

⁷⁵ Baldernock, County of Stirling, OSA, vol. XV, 1795, p. 278.

turn to some account.⁷⁶ His enthusiasm for exploiting the mineral resources of the parish was shared by many other ministers.

In Dunfermline Allan MacLean and John Fernie (first and second charge of the parish respectively) wrote a detailed which noted that ‘this parish abounds with valuable mines and minerals.’⁷⁷ These included freestone, granite and limestone. They described the quarrying of limestone, and the lime works developed by the Earl of Elgin at Charlestown. This was a substantial operation and, according to the account, the most extensive lime works in Britain: ‘From 80,000 to 90,000 tons of limestone are quarried annually. It is partly manufactured into lime at the works; and partly sold in the unburnt stone.’⁷⁸ This demonstrates that demand for agricultural lime was helping to drive industrial development in Fife.

MacLean and Fernie noted the works employed about 200 men and consumed 12,000 tons of coal a year, also mined locally. The description of the works, the associated coal mines and their geology cover eleven pages, one of the longest such descriptions in the OSA.⁷⁹ The ministers were clearly fascinated by the development and were supportive of it. Their only negative comment related to the impact on surface water: ‘Owing to the numerous mines and subterraneous levels which have lately been opened, the water is greatly drained from the surface, and in some places it is scarce, and but indifferent.’⁸⁰ They did not mention air pollution from burning coal but did note some of the social impacts on local communities: ‘Increasing trade, manufactures, and the rapid circulation of money, have had an unhappy influence in their morals.’ Their enthusiasm for industrial development was not matched by enthusiasm for the new class of industrial workers it was producing.

Coal

Coal attracted widespread attention among ministers, being mentioned in 659 (over two thirds) of the accounts. In coalfield parishes they described the operation of coal mining, often in detail and with enthusiasm. Some ministers whose parishes

⁷⁶ Baldernock, pp. 277-278.

⁷⁷ Dunfermline, County of Fife, OSA, vol. XIII, 1794, p. 467.

⁷⁸ Dunfermline, p. 468.

⁷⁹ The scale and importance of the Charlestown lime works are described in a Historic Scotland monograph, *Charlestown Limeworks: research and conservation*, (Edinburgh, 2006).

⁸⁰ Dunfermline, p. 478.

contained no known coal reserves (the great majority of parishes) wrote hopefully about finding it or complained about the cost of transporting it. The most vociferous complaints came from ministers in coastal parishes who called for repeal of the duty on the coastal shipping of coal.⁸¹ While peat remained the principal fuel in most highland parishes, its lower calorific value and the effort required in digging and storing it made it less valuable than coal, as noted by John Walker in an essay on peat and later in 1811 by William Aiton in a treatise on moss.⁸² The levy increased the cost of coal in the remotest parishes and was a source of great resentment. The complaints in the early accounts are of importance because of the attention they received from Sinclair and others, including James Anderson and Henry McNab, who both quoted parish accounts in campaigning for the repeal of the coal duty.⁸³ Henry Dundas was successful in securing the repeal of the tax in 1793, an example of the use of the OSA to influence government policy.⁸⁴

The number of parish accounts that mention coal is so great that it is only possible to provide a small sample here. The parish accounts in Fife provide some of the most detailed descriptions. At Kilconquhar, Alexander Small demonstrated a knowledge of the different types of coal in the parish:

There is a considerable number of coal fields in this parish, which have, in great measure, served the adjacent country for some centuries past, and afford coal of various kinds, as hard, splent, parret, and soft, known here by the name of cherry; and of a mixed nature, in many places; all generally good of their kinds.⁸⁵

He went on to describe the geological challenges of mining in the parish, including rock faulting and the different thickness of the seams and various angles at which they were inclined to the horizontal. He also listed the mines and their owners, the types and prices of coal.

⁸¹ Three examples out of many are Urr, County of Kirkcudbright, OSA, vol. XI, 1794, p. 72; Duffus, County of Elgin, OSA, vol. VIII, 1793, p. 385; and Rothesay, County of Bute, OSA, vol. I, 1791, p.305.

⁸² John Walker, 'An essay on peat, containing an account of its origin, of its chymical principles and general properties', *Prize Essays and Transactions of the Highland Society of Scotland* (1803), vol. 2, pp. 1–137; William Aiton, *A Treatise on the Origin, Qualities, and Cultivation of Moss-Earth, with Directions for Converting it into Manure* (Ayr, 1811).

⁸³ Frederik Albritton Jonsson, *Enlightenment's Frontier: the Scottish Highlands and the Origins of Environmentalism* (New Haven, 2013), pp. 175–181.

⁸⁴ James Anderson, *Observations on the effects of the coal duty upon the remote and thinly peopled coasts of Britain*, (Edinburgh, 1792). Anderson lists twelve ministers who had raised objections to the tax, but many more added their complaints in accounts published after 1792.

⁸⁵ Kilconquhar, County of Fife, OSA, Vol. IX, 1793, p. 298.

Largo-Ward coal, the property of James Calderwood Durham, Esq; of Largo, consists of really short strata, lying in transverse directions, worked by a mine of 3540 yards, upwards of 2 miles long, produces hard and soft coal, generally of good quality, employs at present 37 people for the various purposes, with 2 grieves, and one oversman.⁸⁶

Such details are not unusual and show how some ministers understood the pattern of coal measures under their parishes. Another account is by John Thomson of Markinch who described the geology of the coal fields of Fife and the technology of mining, including the use of steam engines to pump water from the mines. He added a long footnote, Malthusian in tone, discussing the future of the industry in Fife and raising concerns that coal seams in the Kingdom might soon be exhausted⁸⁷ Jonsson has described how this pessimistic view of natural resources became more common towards the end of the eighteenth century.⁸⁸ A Malthusian view of the possible extinction of coal reserves is also apparent in John Williams' *Natural History of Minerals* published in 1789.⁸⁹ This may also reflect what Richard Whatmore has described as a general pessimism about the failure of the enlightenment among politicians, economists and philosophers towards the end of the century.⁹⁰ It is striking therefore that many ministers in the OSA remained optimistic about the development of natural resources. Further examples of coal mining in Fife are given in the parish accounts for Carnock, Dalgety, Dysart and Torryburn.

At Lasswade in the county of Edinburgh, John Paton devoted a quarter of his account to minerals:

The minerals come under the general denomination of coal metals, viz. sandstone, (or freestone,) clays of great variety, having different names according to their colour and degree of induration, a very great number of distinct seams of coal, and three beds of limestone. These extend over the whole of the parish; nor has there as yet been discovered within its bounds any granite or basaltes (here termed whinstone,) in any solid mass, or even contained in any structure, (or dike as it is called) excepting in a small corner on the east end of the ridge of Pentland Hills.⁹¹

The details contained in this short passage indicates that Paton had a good grasp of the geology underlying the parish. He went on to give a detailed description of the

⁸⁶ Kilconquhar, pp. 298-299.

⁸⁷ Markinch, County of Fife, OSA, Vol. XII, 1794, pp. 538-549.

⁸⁸ Jonsson, *Enlightenment's Frontier*, esp. chapter 7 on fears of coal exhaustion.

⁸⁹ John Williams, *The Natural History of the Mineral Kingdom* (Edinburgh, 1789), pp. 172-173.

⁹⁰ Richard Whatmore, *The end of Enlightenment: empire, commerce, crisis* (London, 2023).

⁹¹ Lasswade, County of Edinburgh, OSA, vol. X, 1794, p. 280.

coal strata noting the presence of ‘edge coals’ meaning that the strata were not horizontal but steeply angled close to the surface. He went on: ‘They consist of different seams, small and great, almost innumerable; but in the barony of Loanhead, about the middle of their course through the parish, they amount to twenty-five in number, of workable seams from two to ten feet in thickness.’⁹² He described how the seams appeared to be in the shape of a basin emerging on either side of the river Esk and speculated whether the seams continued deep under the river:

That some of the uppermost seams of coal, which are known to have a rise towards both sides, may be preserved entire and unbroken, in their passage through this trough, is not to be doubted; neither is it to be doubted, that some of the edge coals, after sinking on the N. do rise again on the S. side of this trough, but that they keep entire and unbroken in their passage below this trough is held to be improbable.⁹³

Paton was aware of the number and thickness of the coal seams, the angle of their inclination and where they appeared in the parish. From this information he was able to infer the underlying geological structure, suggesting that there was a basin or syncline under the parish but that the basin was probably faulted, so that the coal measures would not be continuous. This points to a sophisticated understanding of sedimentary geology.⁹⁴

of coal mining in the west of Scotland include those for Cambuslang in Lanarkshire by James Meek and John Bower at Old or West Monkland. In Ayrshire, James Wodrow wrote an outstanding description of the geology of the coal measures in the parish of Stevenston, including an illustration of the geology showing the coal seams in cross section. Similarly, at Sorn in Ayrshire, George Gordon included a description of coal, its mining and geology running to five pages. He quoted a local landowner on the mineral riches of the parish:

The whole of Sorn parish above, and a considerable space below, the church, abounds in coal, lime-stone, and iron-stone; and the White-arch ironore marches with the head of the parish, and runs into it. There is also a string of lead at Hollhouse-mill; and the spar at the Burntshiel-burn is promising. In the river of Ayr

⁹² Lasswade, p. 280.

⁹³ Lasswade, p. 281.

⁹⁴ The first geological map of a coalfield in Britain was of the Somerset coalfield by William Smith in 1799, suggesting Paton and other ministers’ understanding of geology was well informed and up to date. See John Henry, ‘William Smith: The maps supporting his published maps’, *Earth Sciences History*, vol 35 (2016), pp. 62-98.

there is water sufficient for any machinery, and abundance of fall every quarter of a mile." ⁹⁵

Where there was no coal, some ministers complained about its absence or looked for signs of it. At Fodderty, near Dingwall, far from the coalfields of the central belt, Donald Mackenzie was hopeful:

There are appearances of coal mines in the parish. A person was, some time ago, employed to work a part of the coal, when it was found to be of a remarkably inflammable quality; of a clear black colour, so that it appeared to approach nearer to a bituminous substance than to coal. ⁹⁶

At Fintry, Gavin Gibb noted: 'an attempt is just now making to find coal upon the estate of Culcruich, and appearances have hitherto been favourable.' ⁹⁷ In Argyll the lack of fuel was one of the principal disadvantages of parish life as described by Charles Stewart in Strachur and Stralachlan: 'The greatest disadvantage this parish labours under, is the difficulty and expense of procuring fuel. In general, peats are used. If coals could be got free of duty, very few peats would be made in the parish.' ⁹⁸ Similarly, at Monzie in rural Perthshire, George Erskine complained of the absence of coal: 'The principal disadvantage this parish labours under, is its great distance from fuel. The nearest coal to Monzie is 20 miles distant. The common people burn turf, heath, peats, wood, shrubs, and broom.' ⁹⁹ It is striking that even over the relatively short distance of twenty miles, the cost of carting coal was sufficient to make it unaffordable to many. Outwith the coalfields, unless there was access to a coastal harbour or navigable river the availability of coal was limited to those who were relatively affluent.

This small sample of accounts demonstrate the importance ministers attached to coal and the impact it made on the economy of Scotland in the 1790s. Where coal was easily available, economic and industrial development were likely to follow, and where it was absent, parishes lagged behind. There are few references to any environmental damage associated with coal mining or air pollution from the burning of coal. Of particular interest are the descriptions of strata and coal seams, often

⁹⁵ Sorn, County of Ayrshire, OSA, vol. XX, 1798, p. 156.

⁹⁶ Fodderty, County of Ross and Cromarty, OSA, vol. VII, 1793, p. 411.

⁹⁷ Fintry, County of Stirling, OSA, vol. XI, 1794, p. 379.

⁹⁸ Strachur and Stralachlan, County of Argyle, OSA, vol. IV, 1792, p. 573.

⁹⁹ Monzie, County of Perth, OSA, vol. XV, 1795, p. 259.

very detailed, that are given in the OSA. Such information may have been provided by coal owners or mining engineers and gave some ministers a three dimensional understanding of the geology of their parishes.

Iron

References to iron include descriptions of iron ore (iron stone) found in parishes, iron works and products made of iron. The accounts for Lanarkshire offer many details of iron and its working. At Shotts, Archibald Bruce had a particular interest, as both coal and iron stone were to be found in his glebe:

The glebe consists of 44 acres. It might rent as a small farm at 13 L. or 14 L. Sterling. In it there is a seam of coal, of the splint or parrot kind, fully 3 feet thick. There are here two strata of iron stone, the one resting immediately upon the coal, the other a foot nearer the surface, each from 4 to 6 inches thick: there is, at a small distance from this, another seam of coal upon the glebe, of the smiddy or dross kind; this being only two feet thick, would, in a country like Shotts, (though it be of an excellent quality) nearly exhaust its value in working.¹⁰⁰

Bruce described the operations at the Omoa iron works at Cleland on the estate of Colonel William Dalrymple:

The Colonel has throughout his estate here, which is of considerable extent, a seam of coal 2 feet 5 inches thick; 2 feet above the coal, ball iron-stone is found, the balls lying pretty near each other. This stone is superior to any thing of the kind, hitherto found in this part of the country: 3 cwt. of calcined stone yield a cwt of metal; it smelts also without the help of iron ore. Two feet nearer the surface there are two strata of iron stone, each from 6 to 9 inches thick. Below the 2 feet inches of coal, there is another coal 9 feet in thickness, of an excellent quality.¹⁰¹

As with many of the descriptions of coal, the details of the ironstone are recorded precisely, as are the process of iron smelting and employment in the works: 'Nine tons of calcined stone a-day go to the furnace, which casts at the interval of 18 hours, and yields about two tons of pig iron, generally of an excellent quality.' Bruce reported that another iron works was planned for the parish:

The gentlemen engaged in this work say, there is throughout the parish of Shotts such a profusion of coal and iron stone, as might, and in all probability soon will employ several such furnaces as the one now blown in it. Should this prophecy be

¹⁰⁰ Shotts, County of Lanark, OSA, Vol. XV, 1795, p. 55.

¹⁰¹ Shotts, p. 61.

verified, what a change in the appearance and product of Shotts may be expected!¹⁰²

The excitement of the minister at the developments is tangible, as is his interest in the economic geology of the parish. The proximity of coal and iron provided the essential raw materials for the iron industry and, in Lanarkshire, there were landowners who had the skills and finance to exploit these resources. In Bruce's account there is no mention of the pollution inevitably associated with iron works, the waste produced by the furnaces, the toxic smoke, or pollution of the ground waters around the works. To Bruce, the impact of the Omoa works was wholly positive: 'The weekly expence at this work is £80 Sterling, which finding its way to farmers and workmen of every class in the neighbourhood, improves their situation beyond what hitherto they had experienced, in this inland country.'¹⁰³

There is one reference to pollution from an iron works in the account of Carnwath by George Mark. He described the foundry at Wilsontown as 'happy in its situation with respect to materials, for in the very ground on which the blast furnaces are erected (two in number) there are coal, ironstone, limestone, and fire-clay, all essentially necessary for carrying on the manufacture.'¹⁰⁴ However he went on to note that: 'The water that comes from the iron-works seems to be unfriendly to trouts, as none are to be found for a great way below the works, where they formerly abounded.'¹⁰⁵ Such references are few in number in the OSA but they do indicate a small number of ministers were aware of the environmental impact of heavy industry. For most the attractions of 'improvement' were of greater interest, which, as these accounts demonstrate, applied to industrial development as well as agriculture.

Iron stone deposits were described in other Lanarkshire accounts, for example at Old or West Monkland and Blantyre; and from central Scotland there are descriptions of the iron works in the accounts for Falkirk (Carron works), the Devon works at

¹⁰² Shotts, pp. 61-62. A useful nineteenth century account of the growth of the Lanarkshire iron industry, its technology and the associated air pollution is David Bremner, *The industries of Scotland: their rise, progress, and present condition* (Edinburgh, 1869), pp. 32-57.

¹⁰³ Shotts, p. 61. While most ministers appeared to be unconcerned about the impact of the iron industry, some travellers were shocked by the sight of the Carron iron works and its impact on the immediate area; see Nigel Leask, 'You at Once Tremble and Admire: The Carron Ironworks in Romantic Travel Accounts', online at: *Writing the Industrial Revolution* (University of Leeds, no date) <https://writingindustry.leeds.ac.uk/essays/carron-ironworks-in-travel-accounts/> .

¹⁰⁴ Carnwath, County of Lanark, OSA, vol. X, 1794, p. 331.

¹⁰⁵ Carnwath, p. 334.

Clackmannan and, near Edinburgh, at Cramond. As with coal there were ministers in some parishes who hoped for the development of the industry in their parish. At Buittle, which was close to the Solway near Kirkcudbright, George Maxwell recounted that: 'iron ore appears to be in such abundance in Buittle, as well as the neighbouring parishes, that some have thought an iron manufacture might be copiously supplied'.¹⁰⁶ In Aberdeenshire, Alexander Duff at Monymusk noted the presence of iron but the lack of coal effectively ruled out any iron works:

Many years ago an iron mine was discovered in a hill, about a mile distant from the church to the north west; the iron stone has been tried and found to be so rich, as to yield thirteen twentieths of iron, and so near the surface of the ground, that it can be taken out at a comparatively small expence. The reason of its not being wrought, is the scarcity of fuel in this part of the country.¹⁰⁷

The enthusiasm for industrial development is again evident in the accounts, as is the pace of developments taking place in parishes with both coal and iron. There is no sense of irony in the words of Archibald Bruce wondering what kind of place Shotts might become if more iron works are constructed in the parish, and no sense of concern that the iron industry might have a deleterious effect on the environment. Rather he and other ministers welcomed its development as an exciting opportunity.

Lead and other Metals

One notable exception to most ministers' apparent blindness to pollution is found in the account for Leadhills, where toxic waste was having a damaging impact on the fauna and flora around the village. The account was written by William Peterkin who was minister of Ecclesmachan near Linlithgow but who had been minister at Leadhills from 1785 to 1787. The terminology he used was unusually unflattering:

The external appearance of Leadhills is ugly beyond description: rock, short heath, and barren till. Every sort of vegetable is with difficulty raised, and seldom comes to perfection. Spring water there, is perhaps as fine as any in the world: but, the water below the smelting-milns, the most dangerous. The lead before smelting is broke very small and washed from extraneous matter. It contains frequently arsenic, sulphur, zinc, etc. which poisons the water in which it is washed. Fowls of any kind

¹⁰⁶ Buittle, County of Kirkcudbright, OSA, vol. XVII, 1796, p.120.

¹⁰⁷ Monymusk, County of Aberdeen, OSA, vol. III, 1792, p. 68.

will not live many days at Leadhills. They pick up arsenical particles with their food, which soon kills them.¹⁰⁸

He went on to record that horses, cattle and domestic animals could easily be poisoned but suggested (incorrectly) that humans were untouched by this 'distemper'. Premature deaths among the miners he attributed to excessive consumption of spirits rather than lead poisoning. Despite the challenges of their environment, he praised the occupants of the village and their library: 'The Leadhills library contains some trash, but as many valuable books as might be expected to be chosen by promiscuous readers. They are the best informed, and therefore the most reasonable common people that I know.' This remarkable short account demonstrates that Peterkin was aware of the lethal consequences of pollution associated with lead works. He was also unusual in not following the enthusiastic endorsement of industrial development found in other accounts. Such critical commentary is rare from ministers in industrial parishes who almost always accentuated the positive. Peterkin had left the parish by the time he wrote the account and his reasons for writing such a negative account remain unclear.

A range of other metals that might be exploited were of interest to ministers. Isaac Davidson at Whithorn was enthusiastic about the possibilities in the parish: 'Upon the estates of Robert Hathorn Stewart, Esq; of Phisgill, and Hugh Stewart, Esq; of Tonderghie, there are promising appearances of lead mines; upon the lands of the gentleman last mentioned there are also the strongest appearances of copper.'¹⁰⁹ He regretted that the landowners had not chosen to develop this resource. At Alva, John Duncan was similarly excited by the presence of silver and other deposits in the Ochils:

This parish has been distinguished by the discoveries which have been made, in this part of the Ochills, of various metals, and particularly of silver. In the neighbouring parishes of Logie on the west, and Tillicoultry and Dollar on the east, veins of copper and lead have been, at different periods, wrought to a considerable extent; and though veins of these metals, and also of iron ore, have been found in the hills of Alva, yet no experiments of such consequence have been made, as to ascertain their true value.¹¹⁰

¹⁰⁸ Appendix on the Parish of Leadhills, OSA, vol. XXI, 1799, p. 98.

¹⁰⁹ Whithorn, County of Wigton, OSA, vol. XVI, 1795, p. 284.

¹¹⁰ Alva, County of Stirling, OSA, vol. XVIII, 1796, p. 140.

Duncan went on to describe, over six pages, the various ores found in the Ochills, including lead, copper, iron, and cobalt. While Duncan was interested in the natural history of the minerals his mention of their ‘true value’ suggests he was primarily concerned with the commercial opportunities they afforded. At Ecclesmachan the same William Peterkin who wrote scathingly about Leadhills, noted that lead and silver were found together near Bathgate.¹¹¹ At Westerkirk in Dumfries, William Little wrote about the discovery of a rare metal in the parish: ‘In the year 1788, metal was discovered; but, upon trial, it was found to be antimony... this is the only mine of antimony that has, as yet, been discovered in Great Britain.’¹¹² He devoted three pages to describing the metal, its uses and how it was refined.

Other than Peterkin, these accounts all reinforce the impression of enthusiasm on the part of ministers for developing mineral resources. The accounts were written in the 1790s when the demand for coal was growing rapidly for a variety of purposes including iron smelting, lime works, pumping engines, factory power and other industrial or domestic uses. This offered ample opportunity for ministers to learn about these new industries and how coal was powering industrial transformation. In addition, those ministers who were interested in the natural history of coal demonstrated an understanding of the stratigraphy of the underlying rocks. They understood that the geological structures could be complex, convoluted and faulted, and disturbed by igneous intrusions. As such, mining appears to have played an important part in the education of ministers about geology.

Rocks

Table 30: Rocks

Keywords	Number of accounts	Notes
Rocks	456 (48%)	Often refers to coastal rocks or skerries
Freestone	261 (27%)	Usually refer to sandstone
Granite	84 (8%)	
Limestone	262 (27%)	
Volcanic	29 (3%)	

¹¹¹ Ecclesmachan, County of Linlithgow, OSA, vol. II, 1792, p. 368.

¹¹² Westerkirk, County of Dumfries, OSA, vol. XI, 1794, p. 525.

Along minerals there were many descriptions of the different rocks found in parishes across Scotland. Searching on the term 'rocks' produces matches in 456 accounts, with 'freestone' and 'limestone' both mentioned in more than 260 accounts.

Throughout the eighteenth century, the generally accepted account of the origin of landforms was that they were mainly the work of water. Some local landforms were believed to be the result of erosion and deposition by rivers but, more important than this, was the impact of a great flood in the past. This explanation has been called 'diluvialism' or 'neptunism' and, while neither term is mentioned in the OSA, it is likely that most ministers studying natural history would have been taught this account in university, for example by professors such as John Walker.¹¹³ Most ministers who mentioned earth history in the OSA appear to have accepted the standard (diluvial) explanation of earth history but mention of the term 'volcanic' in twenty nine accounts suggests that a small number were aware of the role of vulcanism in the landscape and the 'vulcanist' or 'plutonic' explanations of land forms which were associated with James Hutton.¹¹⁴

The number of mentions of rocks reflects the nature of Scotland's terrain, and especially of coastal parishes, where the underlying geology is more clearly visible and where offshore rocks could create a hazard to shipping. It also points to the economic importance of some rocks, including freestone for building and limestone for lime production. As with minerals there are accounts that demonstrate ministers' interest in the geology of the parish. There are also some accounts that mentioned rocks as part of a picturesque or romantic description of the landscape.

The account of a limestone quarry at St. Cyrus by William Walker illustrates a number of these themes:

The lime rock begins on the shore about flood mark, and the post is now from 12 to 14 feet deep. When first discovered and worked, it lay very near the surface; but it dips in so great a declivity, in a S. W. direction, that there is now 25 feet of earth,

¹¹³ An introduction to these terms and a discussion of their meaning can be found in Rhoda Rappaport 'Dangerous Words: Diluvialism, Neptunism, Catastrophism', in John L. Heilbron (ed.), *Advancements of Learning: Essays in Honour of Paolo Rossi*, (Florence, 2007), pp.101–131.

¹¹⁴ For an introduction to the debate, see D. R. Oldroyd, 'The Vulcanist-Neptunist Dispute Reconsidered', *Journal of Geological Education*, vol. 19 (1971), pp. 124–129. An early example of the debate is given by Sharad Master, 'Plutonism versus Neptunism at the southern tip of Africa: the debate on the origin of granites at the Cape, 1776–1844', *Transactions RSE*, vol. 100 (2009), pp. 1-13.

and brittle red rock, above it. And as there is no level to carry off the water, it is drawn off by a pump, worked by two horses, at great expence.¹¹⁵

The quarry furnished the minister with information about the strata underlying the parish. Walker went on to describe how coal was imported for the lime kilns and the cost of working the quarry. He concluded with a description of the limestone itself: 'The stone is of a blue colour, veined with white; and it is supposed, that, if polished, it would be a beautiful grey marble. It is very hard, and takes a great quantity of gunpowder to force it from its subterraneous bed.'¹¹⁶

The parish also had freestone (sandstone) which was used for building: 'At Laurieston there is an excellent free-stone quarry, of a brown colour, formed, probably, by the chemical process of nature, from a mixture of red clay and sand. The stone is easily cut, and much used for building, in Montrose and throughout all the country.'¹¹⁷ His reference to 'the chemical process of nature' suggests Walker was interested in the process of rock formation. He does not speculate on the age of the rock but must presumably have understood that such chemical processes took place over a long period of time. He described other quarries in the parish of both limestone and freestone and one of: 'the scurdy, or whin-stone kind, in the Heughs of St. Cyrus, of a dark blue colour, which is also used in ruble building'.¹¹⁸ In an important passage, here quoted at length, he tried to understand the patterns of rock as a whole and how they might have been formed.

All these quarries are inexhaustible. The two last mentioned are parts of long chains of rocks, which run through the parish, from W. to E. all the way along the coast. Near the E. end of them begins a species of rock, consisting of pebbles, baked, as it were, with a hard cement, (which we call the plumb-pudding rock), which continues, with some interruptions, beyond Stonehaven. The scurdy rocks, called the Heughs of St. Cyrus, may perhaps have been in a state of vitrification at some remote period. Upon this supposition, the word scurdy may be a corruption of the scoria, which are the effects of volcanic fire. However that may be, the beautiful pebbles, and spars of different sorts, which are intermixed with these rocks, deserve to be mentioned, as they are certainly well worth the attention of those who delight in mineralogy.¹¹⁹

¹¹⁵ St Cyrus, County of Kincardine, OSA, vol. XI, 1794, p. 97.

¹¹⁶ St. Cyrus, p. 98.

¹¹⁷ St. Cyrus, p. 99.

¹¹⁸ St. Cyrus, p. 100.

¹¹⁹ St. Cyrus, p. 100.

Walker had been educated at Marischal College where he graduated with an M.A. in 1768.¹²⁰ It is likely that he was taught by Francis Skene, Professor of Civil and Natural History from 1753 to 1775, who introduced natural history into the arts curriculum.¹²¹ Walker identified many interesting geological features which have subsequently attracted the interest of geologists. The coast in the parish is now recognised as a Site of Special Scientific Interest and a National Nature Reserve on account of its complex geology.¹²² Walker suggested that heat had been involved in the formation of 'plumb pudding rock', which is a conglomerate of large pebbles or boulders baked in a matrix of lava. He also suggested a volcanic origin for the 'scurdy' rocks. Walker not only described the rocks of the parish but sought to explain their origins. He understood that there was a history to geological formations and that both heat and chemical processes had an important role in the formation of rocks.

Another minister who was interested in volcanic origins of rocks was William Mackenzie, in the remote parish of Assynt. He described the: 'wide extent of lofty mountains, high hills, stupendous rocks, threatening precipices, and numberless objects of the like kind'.¹²³

The volcanic influence seems to have had effect here, This opinion is founded on the following particulars: On the bounds of Inchnadaff farm, near its march with that of Stronchruby, not fifty yards from the highway, is to be seen a very large piece of limestone, or rather lime, that suffered fusion, for it has some large common granite stones firmly fixed in it. In some parts of its superficies it is full of pores, and black. In short, it has all the appearance of having suffered the greatest possible heat. Is this the effect of a volcano, or is it not? ¹²⁴

Mackenzie does not mention Hutton, although his description of limestone metamorphosed by heat close to a granite outcrop suggests that he may have been aware of Hutton's *Theory*. Hutton had visited Glen Tilt in Perthshire 1785 and described how a vein of granite was found in the strata of schist. He argued that the molten granite had forced its way into the schist and cooled to form the intrusion, a

¹²⁰ Fasti, vol. VI, p. 482.

¹²¹ Paul B. Wood, *The Aberdeen Enlightenment: The Arts Curriculum in the Eighteenth Century* (Aberdeen, 1993), p. 92.

¹²² See N.H. Trewin, 'Devonian of St. Cyrus and Milton Ness', *Excursion guide to the geology of the Aberdeen Area* (Aberdeen, 1987), pp. 251-258; and also *St. Cyrus Beach: A story of fire and water*, <https://www.scottishgeologytrust.org/geology/51-best-places/st-cyrus-beach/>.

¹²³ Assynt, County of Sutherland, OSA, vol. XVI, 1795, pp. 163-164.

¹²⁴ Assynt, p. 208.

process similar to that described by Mackenzie.¹²⁵ The accounts of Mackenzie and Walker indicate that some ministers were aware of this debate between ‘plutonists’ or ‘vulcanists’ and ‘neptunists’ about the origin of rocks and the extent to which volcanic activity had helped shape the geology of their parishes.

Another example is the account of Inverness, unusually attributed to three ministers, Robert Rose, George Watson, and Alexander Fraser, ‘ministers of that town and parish’, who discussed whether the hill fort summit on Craig Phatric was the product of volcanic action or human activity.¹²⁶ One of the authors had examined vitrified matter near the summit and declared that it unlikely to be volcanic:

An attentive examination of the vitrified work, is not favourable to the abettors of the volcanic hypothesis, who maintain, that the ramparts were built with lava, a material, with which, according to them, the rock abounded, and of more easy acquisition than stones.¹²⁷

While concluding that the vitrified stones were the product of human activity, the discussion is of interest as it refers to papers on volcanicity published in the Transactions of the RSE and its predecessor, the Philosophical Society of Edinburgh.¹²⁸ This indicates that geological debates were not confined to Edinburgh but were discussed by ministers far from the capital.

Accounts written by other ministers discuss alternative theories of landscape formation. Arthur Oughterson of West Kilbride in Ayrshire considered the origins of Ardneil Hill close to the sea at Portencross. He acknowledged the suggestion that this isolated hill, 100 metres high, might be of volcanic origin but suggested an alternative.

But as there is every reason to conclude, that, not only the plain between the precipice and the water, but the inland valley which runs along the back of it, have been once occupied by the sea, and the precipice itself formed into an island, another theory occurs, namely, that this mound has, at some period, been thrown up by the influx and eddy of the tide, and must have been collecting there for ages; but being at last left dry by the retiring of the sea, through length of time it is consolidated into a firm compacted mass.¹²⁹

¹²⁵ James Hutton, *Theory of the Earth*, vol. 3, (ed.) Archibald Geikie (London 1899), p. 13.

¹²⁶ Inverness, County of Inverness, OSA, Vol. IX, 1793, pp. 603.

¹²⁷ Inverness, pp. 634-635.

¹²⁸ Inverness, pp. 634-635.

¹²⁹ West Kilbride, County of Ayrshire, OSA, Vol. XII, 1794, p. 418.

The discussion tells us that Oughterson was aware of changes in sea level in the past, suggesting that it had flooded low lying areas of the parish. He must have been aware of the time needed for loose material thrown up from the sea to be compacted into solid rock but he did not explain how this compaction might have happened. While he makes no reference to any specific theory his explanation indicates an interest in the history of landforms.

The antiquity of some igneous rocks was also mentioned in the account of Kilmore and Kilbride (Oban). Patrick McDonald recalled the visit of an Irish clerical naturalist to the coast of Argyll: 'Dr. Hervey, the Bishop of Derry, and some other naturalists, who were on a tour through this country a few years ago, asserted, that these appearances were certainly volcanic. They evidently bear the traces of having been in an igneous state at some distant period.'¹³⁰ Frederick Hervey (1730–1803) was Bishop of Derry and Earl of Bristol. One biographer has described him as being 'more interested in geology than theology' and the visit to Scotland was one of many tours he undertook across Europe.¹³¹ McDonald, in common with other ministers quoted here, seemed untroubled that the rocks might be of ancient origin. Rather they expressed interest in the history and formation of landforms and contributed local detail to the debate.

As noted above 'rocks' and 'minerals' are terms often used interchangeably in the OSA, particularly in relation to rocks of economic interest. The large number of references to limestone and freestone reflect their economic importance. Carboniferous limestone and sandstone are often found near coal measures and together they formed three raw materials of importance to Scotland's economic development. Robert Boog at Paisley Abbey provided a detailed description of the rocks, minerals and fossils of the parish and their utility. He started with a description of the stone used for building:

Free stone quarries abound in the parish. The stone in most of them is of a good quality, lies near the surface, and generally dips towards the east. A quarry of coarse granite or blue whin, in what was formerly the Abbey garden, affords excellent materials for paving the streets.

¹³⁰ Kilmore and Kilbride, County of Argyle, OSA, vol. XI, 1794, p. 126.

¹³¹ W. Murphy, 'Satisfied with Marrow and Fatness: The Epicurean Theology of Frederick Hervey, Bishop of Derry'. *Field Day Review*, vol. 9 (2013), pp. 112-127, quotation at p. 115.

We have several lime-stone quarries. That at Stanley, the property of the Earl of Glasgow, merits the examination of the curious. An enormous rock, projecting from the brow of a bill, contains the limestone lying in a mass of about ten feet thick, and dipping towards a centre, like the Quarreltown coal. Several mines have been driven into the rock; and these meeting in the heart of it, present a very singular piece of subterranean scenery.¹³²

This brief description contains a wealth of information on Boog’s understanding of the minerals of the parish, mentioning building stone, limestone and coal. He went on to describe the strata underlying the parish as revealed in a mine shaft sunk in 1786, summarised in the table below.

Table 31: Strata revealed in mine shaft in Paisley¹³³

Strata	Thickness (feet)
1. Earth and clay	42
2. Sand and gravel	8
3. Schistus or till, with some thin strata of lime and iron stone	105
4. Limestone	3
5. Schistus, of an aluminous quality	3
6. Coal	5

The mine shaft revealed successive layers of limestone, ironstone coal and other rocks, topped with superficial deposits. As in other coalfield parishes, the mining industry provided information on the underlying strata and helped give the minister a three dimensional understanding of his parish. Boog noted that in the limestone ‘crystals of calcareous spar are found’ and that it also contained a variety of fossils. The schistus was also valuable, containing coperas which was employed in a: ‘green vitriol manufacture, established at Hurlet in 1753 by a company from Liverpool.’¹³⁴ Boog’s interest in the economic geology was matched by his discussion of fossils. The number of mines and quarries described in the accounts had opened up opportunities for Boog and other ministers to learn more about fossils, and the interesting but puzzling questions they posed about natural history.

¹³² Abbey of Paisley, County of Renfrew, OSA, vol. VII, 1793, p. 81.

¹³³ Abbey of Paisley, p. 82.

¹³⁴ Abbey of Paisley, p. 83. ‘Coperas’ is ore containing iron sulphate, a compound which was also known as ‘green vitriol’ and had a variety of uses including the manufacture of ‘oil of vitriol’ (sulphuric acid).

Fossils

The term ‘fossils’ appeared in forty four accounts and included at least three related meanings. The first described minerals of economic interest, such as coal, limestone or marl, which were routinely referred to as ‘fossils’. The second was the remains of old forest trees or animal bones buried in peat bogs or other surface deposits, remains that have been described in the chapter on flora and fauna. The third meaning referred to the petrified remains of animals or plants contained in more ancient strata.

Examples of the first meaning are in the accounts by Andrew Johnston of Salton who referred to coal and limestone as fossils and in the account of Forfar by John Bruce who referring to coal hoped that: ‘this useful fossil might be discovered here’.¹³⁵ Similarly shell marl was described as a fossil by Thomas Robertson of Selkirk: ‘The only fossil, that merits attention in this place, is, an inexhaustible fund of shell marle. It produces wonderful effects upon light and dry soils.’¹³⁶ John Robertson at Little Dunkeld noted the lack of marl and lime in the parish which he called ‘fossil manures’ and complained about the high cost of importing them.¹³⁷ This use of the term ‘fossil’ has subsequently dropped out of use, except for the term ‘fossil fuels’ which continues in use to refer to coal, oil and gas.

The second meaning of the term included remains of animals found in superficial deposits, particularly peat, as well as tree stumps. At Clunie in Perthshire, William MacRitchie reported that the remains of animals long extinct in Scotland had been found: ‘Fossil horns are sometimes found at a great depth in the moss. The head of the Urus has been dug up in this neighbourhood, as also the palmated horns of the elk, together with the horns and skeletons of large deer, supposed to be the moose-deer.’¹³⁸ At Moulin, also in Perthshire, Alexander Stewart described a similar discovery: ‘The scull of a large horned animal was found, some years ago in a marl pit, half a mile from Moulin, and is preserved at Atholl House. It is supposed to have belonged to one of those animals which Caesar calls Uri, and which were found in the

¹³⁵ Salton, County of Haddington, OSA, vol. X, 1794, p. 259; Forfar, County of Forfar, OSA, vol. VI, 1793, p. 521.

¹³⁶ Selkirk, County of Selkirk, OSA, vol. II, 1792, p. 447.

¹³⁷ Little Dunkeld, County of Perth, OSA, vol. VI, 1793, p. 378.

¹³⁸ Clunie, County of Perth, OSA, vol. IX, 1793, p. 257.

Hercynian forest in Germany'.¹³⁹ These discoveries point to ministers' awareness of past environments and suggests ministers were aware that habitats and species had changed over time.

Deeper in the earth, petrified remains offered insights into the earth's more ancient history. Interest in these more ancient fossils among ministers was not new.

Stevenson McGill, in his account of Eastwood and Pollock mentioned a former minister of the parish, Robert Wodrow (1679-1734), a church historian and writer on natural history. McGill recounted that Wodrow 'was among the first who attended to natural history in this country; and he left behind him a small museum of fossils, chiefly collected from his own parish.'¹⁴⁰ Wodrow was librarian at Glasgow University from 1697 until 1701 and minister at Eastwood from 1703 until his death.¹⁴¹ McGill continued the interest of his predecessor noting some unusual fossils at Thornliebank:

The natural historian will find, in several parts of this parish, objects meriting his attention. In the neighbourhood of Thornlie-bank, a small village, there is a stratum of schistus, which has particularly attracted notice. It is a good many yards in thickness, and contains a great variety of marine productions, in a petrified state. Specimens of several genera of shells are found in fine preservation. The orthoceratites both plane and fulcated, retain the original shell; a circumstance which rarely occurs in natural history.¹⁴²

In a footnote to the account McGill notes that David Ure had taught him about fossils. Ure was minister at East Kilbride and an expert on fossils whose work is discussed in chapter seven below.

Three Ayrshire ministers wrote about 'petrifications'. David McCallum at Beith noted that there were remains of marine creatures in the parish: 'The lime stone abounds with petrifications of shells, entrochi and other marine productions; the exuviae of the ancient ocean.'¹⁴³ This is of interest in at least two ways. First, although Beith is an inland parish, the minister understood that the fossils were of marine origin. Second, he believed that that they were from an 'ancient ocean'. This suggests that the

¹³⁹ Moulin, County of Perth, OSA, vol. V, 1793, p. 70.

¹⁴⁰ Eastwood and Pollock, County of Renfrew, OSA, vol. XVIII, 1796, p. 210.

¹⁴¹ Fasti, vol. III, p. 135. Wodrow's son, James (1730-1810) was minister and author of the parish account for Stevenston in Ayrshire.

¹⁴² Eastwood and Pollock, County of Renfrew, OSA, vol. XVIII, 1796, p. 205.

¹⁴³ Beith, County of Ayrshire, OSA, vol. VIII, 1793, p. 327.

minister probably accepted the ‘standard model’ of earth history mentioned in chapter two, in which the surface of the earth and its rocks were gradually revealed by a receding ocean. This model could explain how marine creatures were found in inland rock strata.

McCallum was not alone in finding marine remains inland in Ayrshire. Thomas Miller of Old Cumnock (also inland) described fossil finds in quarries in the parish:

There are several volcanic appearances in them, on which are found stones of the Basaltic species; also a few figured stones; and in the beds of the rivulets, petrification of shells and fish are thrown up from the strata. These are also found in an extensive lime quarry, belonging to the Earl of Dumfries, and one of it, upper beds abounds with a species of coral. The lamina of lime stone in this quarry are of different qualities, and the lime stone in some places, being mixed with shells and spar, takes a very fine polish, and would make a pretty enough blue marble.¹⁴⁴

A third Ayrshire minister, John Fullarton at Dalry, made a similar observation: ‘All the limestone quarries abound with marine petrifications of numerous varieties, and incumbent on some such, quarries, is a bed of stone marl from 3 to 5 feet depth.’¹⁴⁵

The three Ayrshire ministers discussed these fossil finds and their antiquity with equanimity. There is no sense of concern or even confusion about the ancient marine origin of fossils, rather the ministers noted the finds with interest.

Robert Boog at Paisley Abbey, also listed some of the specimens found in the parish:

Fossil shells, and other marine exuviae, are found in great quantities in all our lime quarries; such as entrochi, which are numerous; anomiae, both with the perforated and entire beak; gryphites; milliperes; fungites; several varieties of pectens, and many others, which do not exist in their natural state upon our shores.¹⁴⁶

Like McGill at Eastwood, Boog used the specialised terminology of palaeontology with confidence, presumably assuming his readership would not be confused by such terms. He also noted that some of the specimens were no longer native to Scotland. He went on to describe ‘figured stones’ found at a farm in Harelaw:

The impressions are upon a concave surface, and evidently formed by its application to the convexity of a stem or branch of a tree. In some specimens, they present the appearance of a kind of rhomboidal net-work; in others, that of regular

¹⁴⁴ Old Cumnock, County of Ayrshire, OSA, vol. VI, 1793, p. 408.

¹⁴⁵ Dalry, County of Ayrshire, OSA, vol. XII, 1794, p. 107.

¹⁴⁶ Abbey of Paisley, p. 82.

indentations, nearly resembling what we may conceive would be retained by a soft body from its application to the cone of the fir-tree.¹⁴⁷

Of one indentation he noted: 'no plant precisely resembling it is now known in this country'. This is an impressive display of deductive reasoning about fossil trees.

On the east coast in the parish of Duddingston William Bennet noted the fossils on the shore at Portobello:

Upon the sea coast, in the interstices of rocks and stones, curious and rare specimens of petrified plants and trees have been found. Some of them resembled the finest Marseilles quilting: others formed the evident petrifications of reeds and exotic plants, now known to be indigenous in tropical regions only; a circumstance which as it has sometimes occurred so unaccountably in northern climates, has given rise to so much ingenious speculation, and to so many extravagant theories.¹⁴⁸

Bennet suggested that the fossil remains were of tropical origin but could not explain how they came to be in Portobello. He was also disdainful of those, possibly Hutton and Buffon, whose speculation and theories sought to explain such phenomena. Further detailed descriptions of ancient fossils are found in the account of Kilsyth by Robert Rennie. He described a thin stratum of limestone found in the parish:

It is a conglomeration of small shells, of all sizes, from an inch diameter, till they become so small as to be invisible to the naked eye. Their form is as various as their size: but for the most part, they are long and cylindrical, and somewhat like a screw. I believe the technical name for such is orthoceratitae.¹⁴⁹

Rennie went on to describe a particular discovery: 'At one time, I had occasion to pick up a petrification rather of an uncommon shape, size, and colour. It was lodged in the clay above the lime; and it resembled much an elephant's tooth, at least it was of the colour of ivory, and as smooth.'¹⁵⁰ Rennie devoted several pages to the minerals of the parish and noted that the fossil rich limestone was also of considerable economic importance:

As it consists almost entirely of shells, it is of course, of the best quality; and contains the greatest quantity of calcareous earth, and the least proportion of sand of any lime perhaps in Scotland. Therefore the demand for it is great, and

¹⁴⁷ Abbey of Paisley, p. 83.

¹⁴⁸ Duddingston, County of Edinburgh, OSA, vol. XVIII, 1796, p. 372.

¹⁴⁹ Kilsyth, County of Stirling, OSA, vol. XVIII, 1796, p. 232.

¹⁵⁰ Kilsyth, pp. 232-233.

increases every year. Considerable quantities of it have been sent to Glasgow, by the great canal.¹⁵¹

Rennie was a minister naturalist with a deep understanding of natural history, including fossils, but he was also comfortable with the exploitation of natural resources. He went on to write a natural history of peat bogs, described in chapter eight. There is little evidence in his account of an interest in conservation of natural resources. Rather, his interest in natural history and his interest in the development of natural resources for economic gain went hand in hand.

Other descriptions of fossils included the account of John Bower in Old or West Monkland who noted the discovery of marine fossils sixty feet below the surface in a mine shaft.¹⁵² James Cooper at Baldernock, to the north of Glasgow, found in limestone: 'petrified shells of a variety of kinds, stimulating the conjectures of naturalists concerning the revolutions of this globe.'¹⁵³ The term 'revolutions' was also used to describe geological history by other ministers, including Patrick Graham of Aberfoyle, Andrew Spence at Cockburnspath and David Ure at East Kilbride.¹⁵⁴

Of all the ministers who described fossils it was David Ure who was the most knowledgeable. In the account of East Kilbride he introduced the subject, quoted here in full.

A great variety of curious fossils present themselves to view. Petrifications abound in almost every part of the parish. They are divided into two kinds, viz. recent and antient. The recent comprehend mosses, etc. petrified by water, containing calcareous particles. The antient, or extraneous, divide themselves into two kinds, as they once belonged to the vegetable or animal kingdom. Of the former, there are various kinds of pine, etc. now known by the name of the coal-stalk; of the latter are varieties of shells, entrochi, fishes teeth, and corralloides, which are supposed to have originally inhabited the antediluvian ocean.¹⁵⁵

Ure distinguished between recent and the ancient fossils and gave examples of both found in the parish. He referred to the antediluvian ocean but his questioning tone suggests scepticism about this explanation. The extract above is all he wrote in the

¹⁵¹ Kilsyth, p. 233.

¹⁵² Old or West Monkland, County of Lanark, OSA, vol. VII, 1793, p. 389.

¹⁵³ Baldernock, County of Stirling, OSA, vol. XV, 1795, p. 278.

¹⁵⁴ The origin of the use of this term in the accounts is not clear. It may reflect the political revolutions of the late eighteenth century, but it is equally possible that it might derive from Nicholas Copernicus, whose theories on the revolutions of the heavenly spheres were published as *De revolutionibus orbium coelestium* (Nuremberg, 1543).

¹⁵⁵ East Kilbride, County of Lanark, OSA, vol. III, 1792, p. 429.

account but in a footnote, he referred to his *History of Rutherglen and East Kilbride* which included ‘descriptions and drawings of more than a hundred varieties of these petrifications, along with the subterraneous geography of the parish.’ This remarkable work is discussed in chapter seven.

Fossils presented intriguing challenges for ministers as they did for other observers. Bennet noted that fossils found in Scotland resembled living creatures, which in his own time were found only in tropical countries, and Ayrshire ministers described finding fossils that resembled marine creatures, in their parishes that were far from the sea.¹⁵⁶ While ministers seem to have been happy to report their findings, some expressed scepticism about theories to explain the distribution of fossils. Such questions were not unique to ministers in Scotland but were a source of debate among natural historians across Europe. While the Scottish ministers were writing the statistical accounts, Georges Cuvier (1769-1832) was puzzling over the same questions in the Museum of Natural History in Paris. Drawing on data from fossils found in gypsum quarries around Paris and information from correspondents around the world, Cuvier was able: ‘to reconstruct a reliable and detailed history of the earth and its life’.¹⁵⁷ This came too late for the writers of the OSA, but Cuvier’s work confirmed the importance of fossils for understanding earth history. It is apparent from the OSA that some Scottish ministers were thinking on similar lines.

Landforms

Most parish accounts begin with a section describing the topography of the parish. For example, Angus Bethune at Alness commenced his account with a description of the ‘Situation, Extent, Soil and Produce’ of the parish.¹⁵⁸ In Inveresk (Musselburgh) Alexander Carlyle began with a section entitled ‘Names, Situation, River, Hill, Etc.’.¹⁵⁹ Table 32 introduces some of the main terms used in the OSA and examples of topographical writing are given in the sections below.

¹⁵⁶ Duddingston, p. 372; Beith, p. 327; Dalry, p. 107.

¹⁵⁷ Martin J.S. Rudwick, *Georges Cuvier, Fossil Bones, and Geological Catastrophes: New Translations and Interpretations of the Primary Texts* (Chicago, 2008), p. x.

¹⁵⁸ Alness, County of Ross and Cromarty, OSA, Vol. XIX, 1797, p. 234.

¹⁵⁹ Inveresk, County of Edinburgh, OSA, Vol. XVI, 1795, p. 2.

Table 32: Landforms

Keywords	Number of accounts	Notes
Coasts	391 (41%)	
Hills	770 (82%)	
Mountains	369 (39%)	
Picturesque	104 (11%)	
Rivers	675 (71%)	
Sublime	27 (2%)	

The topography and landforms of parishes across Scotland was a subject of interest to most ministers. Of the 938 accounts, 770 mention hills, 369 describe mountains and 685 rivers. Given these numbers there are far too many examples to describe them all individually. It is possible to identify themes that emerge from the accounts that are useful in helping understand ministers' interest in the history of landforms and how landforms change over time. Also in relation to rivers are some descriptions that invoke the contemporary fashion in writing about places, the language of the picturesque. This provides an interesting contrast with the utilitarian descriptions of species noted in the chapter on flora and fauna.

Hills and Mountains

With hundreds of references, both hills and mountains feature prominently in the accounts. Most are simple descriptions of uplands of the parish, but some go into more detail. Joseph Smith at Birse on Deeside gave a detailed account of the hills of his Aberdeenshire parish regretting that he did not know their exact height. 'There has been no map or distinct measurement of this parish. The height of the hills cannot therefore be exactly specified.'¹⁶⁰ His concern about the lack of precise data reflects an enlightenment concern to understand the geography of Scotland better, a concern explored in a number of publications by Charles Withers.¹⁶¹ It is manifest in the growing number of maps, and accurate surveys of Scotland prepared in the late eighteenth century and is reflected in several of the accounts.

¹⁶⁰ Birse, County of Aberdeen, OSA, vol. IX, 1793, p. 107.

¹⁶¹ See Charles W.J. Withers 'How Scotland came to know itself: geography, national identity and the making of a nation 1680-1790', *Journal of Historical Geography*, vol. 21 (1995), pp. 371-397; and Chris Fleet, Margaret Wilkes and Charles W.J. Withers, *Scotland: Mapping the Nation* (Edinburgh, 2012).

Smith went on to describe the vegetation, uses and ecological history of the hills:

All the hills are rocky and covered with heath, interspersed with pasture, straths and green vallies. There on the Grampian hills our frugal swains do literally feed their flocks. The hills produce a variety of herbs, the names and virtues of which we cannot pretend to specify; also many sorts of berries, the blue berry, cranberry, cloudberry; in rocky places, the bramble, rasp, and strawberry of a small size. The hills also abound with moss; it is indeed inexhaustible, but of difficult access. In the mosses situated in the lower grounds of the parish are dug up the remains of old oaks, which appear to have been of a prodigious size.¹⁶²

The amount of detail in these five sentences is remarkable but not untypical, including a list of berries found on the hills and noting the presence of ancient tree in peat bogs. Smith went on in the account to provide a detailed list of the birds and mammals of the parish. Smith (1750-1831) was minister of the parish from 1789 and does not appear to have published anything other than the account. Educated at Marischal College, he had been a schoolteacher for a decade before becoming a minister. He is an example of a minister who, while educated in natural history at university, was not a member of the urban *literati* but whose account is full of interest and understanding of the natural environment and he was clearly educated in natural history.¹⁶³

Other highland accounts described the mountain environment. William Mackenzie (1734-1816) was also educated at Marischal College and was a schoolteacher at Stornoway before becoming minister at Assynt from 1765. In his account he introduced the parish with its: 'wide extent consisting of lofty mountains, high hills, stupendous rocks, threatening precipices, and numberless objects of the like kind.'¹⁶⁴ The account of forty nine pages contains descriptions of the weather and harvests, coast and islands, woodland history, ancient monuments and mountains. At Callander, James Robertson offered his own interpretation of the importance of mountains. He noted that in Scotland as elsewhere many mountains were organised into ranges and suggested this may help maintain the integrity of the earth:

Perhaps these, and other chains of rocks, are the bones and sinews of this globe, which is not only indebted to the ministring [sic] powers of attraction, cohesion and gravity, that regulate its motions, and keep the lower materials together, but is

¹⁶² Birse, p.107.

¹⁶³ Fasti, vol. VI, p. 84.

¹⁶⁴ Assynt, County of Sutherland, OSA, vol. XVI, 1795, p. 163-164.

firmly girt about by mighty bands; for all the principal mountains of the world run in chains.¹⁶⁵

Robertson appeared to be suggesting that, together with the Newtonian forces of gravity, mountains helped hold the crust of the earth together. This description appears to be unique to Robertson and does not appear in other accounts. Nor does it seem to be related to the theories of Hutton or Buffon, but it does indicate that Robertson was pondering the structure and history of mountain ranges.

In Greenock Archibald Reid considered some hills in the parish to be the product of fire:

The hills, for the most part, seem to be a mass of whin, very compact and solid in some parts; in others, especially toward their summits, chinky and friable. In not a few places, the rocks seem once to have been in a state of fusion, and loose stones scattered here and there, exhibit so much the appearance of the cinders of a smithy furnace, that there can be little doubt of their having undergone, some time or other, the action of fire.¹⁶⁶

What Reid described may have been the remnants of a vitrified hill fort or they may have been metamorphic rocks; it is difficult to tell from the account. If it is the latter, then this suggests Reid was aware of the debate about the respective roles of water and fire in earth history. Reid went on to describe raised beaches in the parish, well above the highest tide. From his observations he concluded that 'it is evident, that the sea has greatly receded'.¹⁶⁷ He did not attempt to explain why sea levels had changed and was sceptical of theories that sought to do so:

The contexture of sea-pebbles, as they are called, which are scattered on some parts of the shore, and some pretty large blocks of greyish which, scarcely yielding to any force but that of gunpowder, and in texture perfectly resembling Shakespeare's unwedgeable and gnarled oak, it will not be easy to account for, on the principles of any of those theories of the earth, which in succession have been, with too much confidence, ushered into the world.¹⁶⁸

This mixture of interest, observation, and reading of natural history combined with scepticism of theory is representative of many of the accounts noted above.

¹⁶⁵ Callander, County of Perth, OSA, vol. XI, 1794, p. 590.

¹⁶⁶ Greenock, County of Renfrew, OSA, vol. V, 1793, p. 563.

¹⁶⁷ Greenock, p. 567.

¹⁶⁸ Greenock, p. 567.

Rivers

Most accounts (675 or 71% of the total) mention rivers in their parish, which is not surprising given the importance of water and rivers in the Scottish landscape. Rivers are significant in understanding ministers' attitudes towards the history of landforms both because of their role in the diluvial theory of landscape formation and in Hutton's *Theory*. The action of rivers in moving material and helping to shape the landscape had been debated for centuries and the importance of fluvial erosion remained controversial in the eighteenth century.¹⁶⁹ Hutton identified the erosion of soil and other surface materials by running water as the principal agent by which hills and mountains were reduced over time. It is therefore of interest to search for any clues that may give insights into ministers' understanding of how rivers shaped landscapes and any implied references to Hutton.

Rivers occur in a variety of context in the OSA; they are named in descriptions of parish boundaries or highlighted as important features in the landscape. They are sometimes mentioned as a threat (flooding) or as a resource, for example as a means of transport in a parish or as a source of fish. John Scott at Avendale (Strathaven) is an example of a minister who described the River Aven as a topographical feature:

The Aven, which rises on the confines of the parishes of Sorn and Galston, runs from S. W. to N. E. the whole length of this parish, dividing it nearly into two equal parts. In its course, it is augmented first by a cut from Lochgate, which is the boundary between this and the parish of Galston, and afterward by the waters of Givel. Calder, Lockhart, Kype, Pomilion, and a great number of smaller streams.¹⁷⁰

George Baird of Dowally in Perthshire was aware of the role of rivers in eroding hills and transporting material downstream, sometimes with destructive consequences: 'the Tay and the Tumble often overflow part of the haughs near their banks, and instead of improving, desolate them, by depositing the gravel they have torn from the mountains.'¹⁷¹ Likewise in the parish of St. Ninians, near Stirling, William Sheriff reported that the river Carron frequently overflowed and noted its power of water to move large objects, as at Loch Coulter: 'on the evidence of witnesses still alive, that about twenty-four years ago, by some convulsion of nature, a stone weighing nearly a

¹⁶⁹ Gordon L. Davies, 'The eighteenth-century denudation dilemma and the Huttonian Theory of the Earth, *Annals of Science*, vol. 22 (1966) pp. 129-138.

¹⁷⁰ Avendale or Strathaven, County of Lanark, OSA, vol. IX, 1793, p. 383.

¹⁷¹ Dowally, County of Perth, OSA, vol. XX, 1798, p. 487. 'Tumble' refers to the River Tummel.

ton was thrown from its bed in the loch to the distance of some yards to the northward.’¹⁷²

The Spey at Abernethy was prone to flooding, frequently overflowing its banks. William Duncan considered it almost impossible to protect fields from flooding: ‘What increases the difficulty is, the great body of water which, in time of floods, comes from the mountains in the Nethy and smaller rivulets, and which would come in behind the embankment.’¹⁷³ The Nethy itself he observed: ‘is very inconsiderable; but after rains or thaws, it swells so as to bring down loose all the timber that is cut in the woods, either to the saw-mills or to the Spey, whence it is sent to the sea at Garmouth.’¹⁷⁴ Charles Stewart at Strachur and Stralachlan on Loch Fyne was equally aware of the destructive power of water.

The river Cur annually carries away several acres of excellent soil. When swelled in different parts of its course, it undermines its banks, which tumble down and are carried away. It leaves a heap of gravel on the opposite side, which takes a long tract of years before it is covered with so much depth of soil as to produce a crop.¹⁷⁵

Most references to river erosion describe its destructive power but there are exceptions. At Forgandenny, Robert Thomas reported that autumn floods could wash away crops ‘but what damage is sustained in this way, is amply compensated by the rich particles of earth, which are washed from the hills, and deposited upon the meadows, and which serve them, in general, instead of manure.’¹⁷⁶ James Hutton’s farm at Slighouses was in the parish of Bunkle and Preston in Berwickshire where the river White Adder was also prone to flooding. Robert Douglas described its effects:

The river Whittater runs with great rapidity, and at some places rises 15 feet perpendicular above its ordinary channel, overflowing the haughs and carrying off great part of the soil. Attempts have been made by several heritors to make barricadoes, but few of them have been successful. A very great flood happened in October 1775, which carried down every bridge, excepting the bridge at Preston, in this parish.¹⁷⁷

¹⁷² St Ninians, County of Stirling, OSA, vol. XVIII, 1796, p. 393.

¹⁷³ Abernethy and Kinchardine, County of Inverness, OSA, vol. XIII, 1794, p. 130.

¹⁷⁴ Abernethy and Kinchardine, p. 131.

¹⁷⁵ Strachur and Stralachlan, County of Argyle, OSA, vol. IV, 1792, p. 558.

¹⁷⁶ Forgandenny, County of Perth, OSA, vol. III, 1792, p. 302.

¹⁷⁷ Bunkle and Preston, County of Berwick, OSA, vol. III, 1792, p. 153.

Hutton spent the years 1754-1767 at Slighhouses promoting new agricultural innovations and it may be the case that his observations and frustrations at seeing soil washed away by the river provided some of the evidence of erosion that contributed to the *Theory of the Earth*.¹⁷⁸

More than 100 accounts mention flooding and its consequences but one stands out in particular because of its implicit reference to Hutton, that of Patrick Graham of Aberfoyle. Graham was a keen observer of the natural world whose account is full of details of the geology and landscapes:

A lengthened track of country, bounded on every side by lofty mountains, traversed through its whole length by a river, now become considerable by the accession of numberless streams, and which, after losing itself, from time to time, in extensive lakes, at length bursts out by a narrow passage into a great plain, seems to promise a fair exhibition of the real effects that are to be attributed to running water, that universal agent, as some modern philosophers account it, in changing the superficial aspect of our earth.¹⁷⁹

Although Hutton is not mentioned by name, it is likely that he and Buffon, are the ‘modern philosophers’ referred to in this passage. Graham went on to develop his critique:

In contemplating this, and similar scenes which occur everywhere in the Highlands, one cannot help observing, that, had the great excavations between the mountains been occasioned by the gradual attrition of the running waters, the effects produced must have been much more considerable, than the formation of a few scanty spots of fertile soil in the subjacent valleys.¹⁸⁰

Graham knew the parish well and questioned the evidence behind Hutton’s theory. He suggested from local knowledge that the power of rivers in the parish was insufficient to support Hutton’s claim that rivers eroded mountains and transported material to the sea. This was an important contribution to the debate and Graham is considered in more detail in chapter eight. In all the accounts he was one of very few ministers who seems to have been critical of Hutton, and his objections arose not from a theological perspective, but from empirical observation.

¹⁷⁸ Jean Jones, ‘James Hutton’s agricultural research and his life as a farmer’, *Annals of Science*, vol. 42 (1985), pp. 573-601.

¹⁷⁹ Aberfoyle, County of Perth, OSA, vol. X, 1794, p. 116.

¹⁸⁰ Aberfoyle, p116.

Coasts

Even more than rivers, coasts are dynamic environments subject to constant change. Cliffs are eroded by storms, rivers deposit material into the sea, and sand or pebbles are moved along the coast by longshore drift. One of the fullest descriptions in the OSA of coastal landforms is that of the Maviston sandhills near Findhorn in the account of Dyke and Moy by John Dunbar. The account is contained in an appendix of seven pages, entitled ‘Causes, Antiquity, and Effects, of the Maviston Sand-hills, etc.’¹⁸¹ Now known as the Culbin Sands, this dune system was one of the largest in Britain and an object of fascination for the minister: ‘In passing through the parish of Dyke, no object strikes the attention sooner, or more excites the curiosity of travellers, than the sand-hills, piled up along the coast. Some account of their causes, antiquity, and effects, may be expected in a publication of this nature.’¹⁸² His account discussed the composition of the dunes, their origin and impact on the parish. Dunbar argued that the sand may have originated from the sea but that the dunes had been shaped by the wind:

These hills contain no different strata, or other marks of an original state. Nor could they receive their formation from the sea, as is commonly supposed, having no mixture of shells, pebbles, or sea-weeds. They are an immense accumulation of a pure white sand, of the smallest grit. Doubtless the sea has, at some time, supplied the material; but the winds have always been the arbiters of their form, situation, and size.¹⁸³

Dunbar noted the lack of stratification and the purity of the sand in the dunes and concluded that it was the wind and not the sea that had shaped the dunes. He went on to discuss the importance of the direction of the prevailing wind in shaping the dunes:

They rise gradually on the south-west, and are steep on the south-east side. This is the tract of our strongest winds here, which further appears, by the bent and falling of trees in the same direction. The smallest particles are always the first suspended, and the last that are deposited by water, after which, they lie nearest to the winds, and are easily swept away, while stones, pebbles, shells, and sand of a

¹⁸¹ Dyke and Moy, County of Elgin, OSA, vol. XX, 1798, pp. 228-234. The dunes were subsequently forested, see James Hansom ‘Beaches and dunes of the Moray Firth coast’ in Colin K. Ballantyne and John E. Gordon (eds.), *Landscapes and Landforms of Scotland* (Cham, Switzerland, 2021), pp. 381-394.

¹⁸² Dyke and Moy, p. 228.

¹⁸³ Dyke and Moy, p. 228.

larger grit, are left upon the beach. This accounts for the shape of these hills, and for the fineness and purity of their sand.¹⁸⁴

From recording his personal observations, he went on to discuss the historical records relating to the dunes. He believed that the creation of the dunes predated any documentary evidence but discovered records showing that the dunes had been in movement for several centuries. Quoting Boethius and John of Fordun, he suggested that a comet had been associated with a great storm in the North Sea in the eleventh century and that this had resulted in a large amount of sand being deposited on the coast. There are records of great storms in the North Sea in 1014 and 1099 but the mineral composition of the sand suggests that it was granitic in origin and came, not from the sea, but from the mountains and was transported to the coast by the Findhorn and other rivers.¹⁸⁵ Dunbar noted local evidence that the sands had moved eastwards engulfing farmlands along the Moray coast:

The effects of the lodgement of sand then made, have spread considerably during the last 700 years, and overwhelmed, with a deep cover of dry sand, many grounds which the sea had, at its reflux, left tolerably clear. The barony of Culbin, lying nearest to the Maviston hills, and most in the tract of the strongest winds, was most exposed, and for many years suffered gradual encroachments, and diminutions of rent and population.¹⁸⁶

The effects of the shifting sand were felt not only on farmland but also on the course of the river Findhorn: 'Another effect of the sand-hills, is a change made, in the last century, of the bed and mouth of the river, which has now got a shorter passage to the sea, and occasioned an entire removal of the harbour and town of Findern, for more than half-a-mile down the frith.'¹⁸⁷ The effect of the storm of 1694 had been catastrophic for the settlement at Findhorn:

Since the former channel was deserted, both ends of the old bar have been considerably washed away and shortened by the tides. Some of the stones of the old town, which have subsided, are yet to be seen at ebb of tide, in a clear day, lying at the bottom of the salt-water, when boats are passing over them.¹⁸⁸

¹⁸⁴ Dyke and Moy, p. 228.

¹⁸⁵ J.A. Steers, 'The Culbin Sands and Burghead Bay', *The Geographical Journal*, vol. 90 (1937), pp. 498-523.

¹⁸⁶ Dyke and Moy, p. 232.

¹⁸⁷ Dyke and Moy, p. 233.

¹⁸⁸ Dyke and Moy, p. 234. For a recent account of the catastrophe, see Gordon Raeburn 'The repercussions of the Culbin Sands disaster of 1694: the emotional impacts of a shifting landscape in North-East Scotland', *Landscape History*, vol. 43 (2022), pp. 5-21.

Dunbar (1733-1807) who was educated at Marischal college, graduating with an M.A. in 1754. does not appear to have published anything other than this account. His description of the dunes suggests an interest in geomorphology (the study of landforms) and is impressive in the range of sources he draws upon, including detailed observation, local knowledge and historical records.

To the southeast, in the Berwickshire parish of Cockburnspath Andrew Spence described the different strata exposed at the coast:

...the upper part consisting of schistus rock, the lower, of strata of sandstone, coal, etc.; their line of junction passes through the middle of the parish, nearly in a direction from N.E. to S.W. Their actual meeting may be seen at the bottom of some of the glens, but still better in a rock washed by the sea at a place called Siccar Point, where the strata of sandstone lie horizontally on the broken edges of the schistus, whose beds are at that particular spot nearly in a vertical position; a scene highly interesting to those who attend to the mineralogical history of the globe.¹⁸⁹

At Siccar point Spence was describing one of the most important geological sites in Scotland. Hutton had visited the site in 1788 with John Playfair, minister and Professor of Natural Philosophy at Edinburgh University and the local landowner, James Hall. A sketch of the scene was made at the time by James Hall (figure 7).

¹⁸⁹ Cockburnspath, County of Berwick, OSA, Vol. XIII, 1794, pp. 221-222.

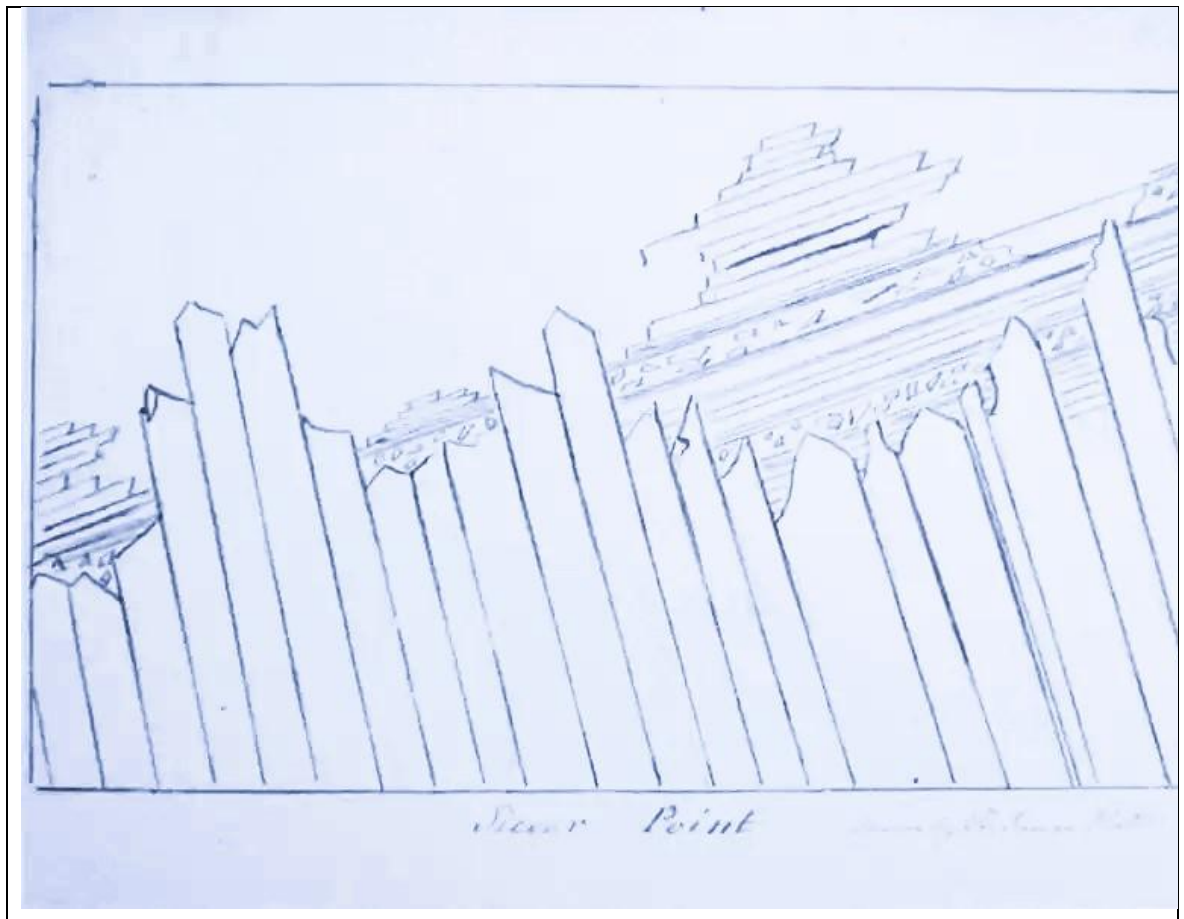


Figure 7: Sketch of Hutton's Unconformity, Siccar Point by James Hall

The underlying strata of steeply tilted rocks are composed of greywacke, a sedimentary rock deposited 435 million years ago. The strata above, lying almost at a right angle to the greywacke, are sandstones and conglomerates 370 million years old. Hutton's theory explains this 'unconformity'. The greywacke was deposited on the seabed, then over millions of years had been uplifted above sea level and contorted by enormous heat within the earth. The greywacke was eroded by the action of water and subsequently sank under the sea, to be covered by new deposits of sandstone, which were then themselves uplifted and eroded, the whole process taking over 50 million years.¹⁹⁰

Spence went on to describe the geology of the parish in more detail:

Several thick beds of gravel lie upon the sandstone of the lower division, composed of rounded pieces of schistus, whinstone, porphyry, granite, and sometimes limestone; all of which it is probable have been carried into their present position by some great revolution of the globe, since none of them, except the schistus, occur in this parish, in their native place.¹⁹¹

¹⁹⁰ Source:

[https://commons.wikimedia.org/wiki/File:Huttons_Unconformity_at_Sicar_Point_by_James_Hall_\(1788\).jpg](https://commons.wikimedia.org/wiki/File:Huttons_Unconformity_at_Sicar_Point_by_James_Hall_(1788).jpg).

¹⁹¹ Cockburnspath, p. 222.

As noted above ‘a great revolution the globe’ is a phrase that occurs in in more than one account. Spence did not commit to any theory of earth history in his account, but he was aware of Hutton’s visit to Siccar Point.

Playfair went on to promote Hutton’s Theory in his *Illustrations of the Huttonian Theory of the Earth* (1802). Hall held no academic position but published on geology and went on to be president of the Royal Society of Edinburgh. The momentous day when they visited Siccar Point was later described by Playfair:

On us, who saw these phenomena for the first time, the impression made will not easily be forgotten. The palpable evidence presented to us of one of the most extraordinary and important facts in the natural history of the earth gave a reality and substance to those theoretical speculations, which, however probable, had never till now been directly authenticated by the testimony of the senses.¹⁹²

Playfair was describing a turning point in the history of geology. Under Hutton’s tuition, he and Hall were able to understand a mechanism that could explain much of the complexity and inconsistencies in geological strata, a process that took place over an immense, almost unimaginable, period of time.

Beauty in the landscape: the Picturesque, Sublime and Romantic

While most of the writing in the OSA is descriptive and factual, some accounts described the beauty of landscapes in the parish invoking the language of the picturesque, sublime or romantic to describe the scenery. There have been many studies of the development of these concepts and how they shaped writing about the landscapes of Britain.¹⁹³ Malcolm Andrews traced the development of writing about picturesque beauty from 1750 to 1800 and how appreciation of beauty in the landscape changed during that time. Edmund Burke’s *Enquiry into the Sublime* of 1757 was influential in changing perceptions of beauty.¹⁹⁴ Later, from 1783, William Gilpin published a series of didactic guides, instructing travellers how to look at landscapes and offering guidance to landowners on the creation of picturesque

¹⁹² Transactions, RSE, vol. 5, part 3 (1803), p. 72.

¹⁹³ See for example: Malcolm Andrews, *The search for the picturesque: landscape aesthetics and tourism in Britain, 1760-1800* (Stanford, 1989); Nigel Leask, *Stepping Westward: Writing the Highland Tour c. 1720-1830* (Oxford, 2020), especially chapter 5, pp. 171-217, on Dorothy Wordsworth and the Legacy of the Picturesque Tour in Scotland.

¹⁹⁴ Edmund Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (London, 1757).

scenery.¹⁹⁵ Towards the end of the eighteenth century Richard Payne Knight and Uvedale Price, published theories of picturesque beauty.¹⁹⁶ An analysis of the development of these approaches to landscape is beyond the scope of this thesis, but it is of interest to note that some ministers adopted the language of the picturesque to embellish their accounts. Over 100 accounts mentioned the term 'picturesque' which, literally, meant to look at a landscape like a picture. One example comes from James Johnston at Blairgowrie:

Here hawks nestle, and their young ones have been frequently carried away by falconers from different parts of the kingdom. Here, also, the natural philosopher and botanist may find ample amusement. Two miles farther down this river is the Keith, a natural cascade, considerably improved by art.¹⁹⁷

The tone of the description is different to the utilitarian style of many accounts and, unlike some accounts noted above, Johnston did not describe the hawk as a nuisance. Rather, he presented the landscape as a playground for natural historians. At the same time, he remained attached to the ideology of improvement, noting the 'natural cascade had been improved by art', and he included four pages on agricultural improvement.¹⁹⁸ For Johnston 'art' and 'improvement' were not in conflict but went hand in hand.

Another example is from Largo in Fife, where Spence Oliphant described the landscape in these terms: 'To the traveller, the south part of this parish must afford a picturesque and delightful scene of elegant country-seats, skirted with well laid out and thriving plantations, populous villages, surrounded with fertile fields, hill and dale, wood and water.'¹⁹⁹ Oliphant described a landscape that was picturesque and prosperous. Such well ordered improvement had been criticised by Uvedale Price for its 'monotony and baldness'²⁰⁰ However ministers such as William Bennet, who were supporters of improvement, also embraced the picturesque in his description of Duddingston: 'The most beautiful and picturesque scenery expands before it, and on

¹⁹⁵ William Gilpin, *Observations on the River Wye and Several Parts of South Wales, etc, Relative Chiefly to Picturesque Beauty: Made in the Summer of the Year 1770* (London, 1783).

¹⁹⁶ Richard Payne Knight, *An Analytical Inquiry into the Principles of Taste* (London, 1805); Uvedale Price, *An Essay on the Picturesque, as Compared with the Sublime and the Beautiful; and on the Use of Studying Pictures, for the Purpose of Improving Real Landscape* (London, 1794).

¹⁹⁷ Blairgowrie, County of Perth, OSA, vol. XVII, 1796, p. 194.

¹⁹⁸ Blairgowrie, pp. 202-205.

¹⁹⁹ Largo, County of Fife, OSA, vol. IV, 1792, p. 534.

²⁰⁰ Price, *Essay on the Picturesque*, p. 18.

every side. The views which it commands include every object which the painter would select to compose a rich or a finished landscape.'²⁰¹ Bennet went on to list the details that contributed to the scene, including 'magnificent villas, towering castles, rich vallies, cultivated fields, woods, groves, ruins; the lake below, the bold precipices of Arthur's Seat behind; the hills of Pentland, Moorfoot, and Lammermoor, bounding the prospect upon the west and south and the sea sinking in the distant horizon, upon the east'.²⁰² As with Oliphant's description of Largo there is no evidence that these ministers believed that a picturesque landscape was inconsistent with improvement. Rather the opposite was the case; for them improvement could make a landscape more picturesque.

A similar description of an 'improved' landscape was of Mertoun near Melrose by James Duncan:

From Bimersyde-hill, the property of Mr. Haig, over which one of the most publick roads in the parish passes, the eye of the traveller is at once gratified with every thing beautiful and magnificent, wood, water, hills, ruins, and fertile fields. The rest of the parish, gradually declining to the S., is also extremely pleasant; the prospect being agreeably diversified with excellent enclosures, beautiful hedge-rows, and thriving plantations.²⁰³

Mertoun was one of many parishes in the borders that had experienced agricultural change and Duncan, like almost all other ministers, approved of the changes. He noted the application of 'immense quantities of lime' to improve the soil and 'neat thriving hedges and plantations'²⁰⁴. It is important to note that the beauty in the landscape he was admiring was a modern agricultural creation, not a survival from the past.

About 40 years ago, the tenants were miserably lodged, the fields open and exposed to every blast, and hardly a tree to be seen, a few about the houses of the different proprietors excepted. Now the scene is agreeably changed; the tenants possess warm and comfortable houses, many of them large, and most of them slated; the greater part of the arable land is enclosed, and surrounded with belts and clumps of plantation.²⁰⁵

²⁰¹ Duddingston, County of Edinburgh, OSA, vol. XVIII, 1796, p. 358.

²⁰² Duddingston, p. 358-9.

²⁰³ Mertoun, County of Berwick, OSA, vol. XIV, 1795, pp. 586-587.

²⁰⁴ Mertoun, p. 587.

²⁰⁵ Mertoun, p. 587.

‘Improvement’ in the eyes of Duncan was not just about improved yields and increased income; it was also aesthetic. Investment in field enclosures and plantations had made the landscape more productive and more beautiful.

Rivers were the subjects of some picturesque descriptions. At Langholm, Thomas Martin praised the beauty of his parish: ‘From Langholm to Longtown, the beautiful and picturesque scenery that every where captivates the eye, along the banks of the Esk, is the delight and admiration of every stranger.’²⁰⁶ He extolled the beauties of the river:

The verdant hills beautifully skirted with wood, which shelter it on the E. and W.; the Esk, “o’erhung with woods” gliding gently along, the town appearing through the intervening trees, and the hills and woods at a distance, (assuming a semicircular form), terminate this charming landscape; a landscape, of which, as containing an assemblage of rural beauty, and romantick scenery, it battles the happiest efforts of imagination to give an adequate description.²⁰⁷

At Bothwell Michael MacCulloch was impressed by the meandering of the Clyde in his parish: ‘The only river is the Clyde, which waters the parish along the south side, in a gentle declivity, with beautiful windings, and here and there shallows, for the space of three or four miles.’²⁰⁸ In a section entitled ‘Miscellaneous Remarks-Beauty of Clydesdale, or Fine Prospects’ he described the most attractive riparian scenes:

There are many of these in the parish. One is, the view from the west point of the village of Uddingston, down the river. It terminates upon Daldowie, where nature, aided by an excellent taste, has formed one of the most beautiful places upon Clyde.... A little above this, the vale is contracted, the banks are wide and deep, with a gradual declivity on both sides, which are occupied by gentlemen’s seats, highly cultivated and embellished. Woods and plantations stretch along the banks. Numerous orchards are interspersed through the groves.²⁰⁹

MacCulloch was typical of many in praising the work of landowners, but his parish was not wholly verdant. Like many Clydeside parishes it was the scene of new coal workings and associated industries. As noted in the area study of parishes near Glasgow, the villas and landowners praised by MacCulloch were, in many cases, the product of new wealth generated by trade and industry. Both agriculture and industry

²⁰⁶ Langholm, County of Dumfries, OSA, vol. XIII, 1794, p. 594.

²⁰⁷ Langholm, County of Dumfries, OSA, vol. XIII, 1794, p. 594.

²⁰⁸ Bothwell, County of Lanark, OSA, Vol. XVI, 1795, p. 314.

²⁰⁹ Bothwell, pp. 328-329.

contributed towards landscapes that were, for some ministers, both improved and beautiful.

William Gilpin

As noted above, there were many writers who described landscape using the language of the picturesque. The English clergyman and travel writer William Gilpin (1724-1804) played a significant role in shaping such descriptions. Gilpin visited the River Wye in 1770 and some years later published a short illustrated guide *Observation on the River Wye* (1783).²¹⁰ The account sold well and Gilpin went on to publish other guides, including one describing a short visit to Scotland in 1776, published in 1789.²¹¹ He became one of the most influential travel writers of the decade and is credited with promoting the picturesque.²¹² Gilpin saw beauty in landscapes where some previous writers had found none. Samuel Johnson, in his tour of Scotland in 1773, had written dismissively about the barren and sterile appearance of the highland landscapes and the lack of trees in the lowlands. In contrast, Gilpin was more positive. A painter, he sought out the best views and, in his writings, suggested how travelers should look at them:

We travel for various purposes- to explore the culture of soils, to view the curiosities of art, to survey the beauties of nature, and to learn, the manners of men, their different politics and modes of life. The following little work proposes a new object of pursuit; that of examining the face of a country by the rules of picturesque beauty: opening the sources of those pleasures which are derived from the comparison.²¹³

Gilpin offered a new way of viewing landscapes, both natural and artificial, with simple rules of composition to describe or criticise the scene. He was not shy in pointing out deficiencies in the landscape and encouraged landowners to make changes through careful planting or building. For example, he was critical of the Earl of Bredalbane at Taymouth Castle for failing to create a picturesque landscape that made the most of the magnificent setting. The house was 'convenient but not

²¹⁰ William Gilpin, *Observations on the River Wye and Several Parts of South Wales, etc, Relative Chiefly to Picturesque Beauty: Made in the Summer of the Year 1770* (London, 1783).

²¹¹ William Gilpin, *Observations, Relative Chiefly to Picturesque Beauty, Made in the Year 1776, on Several Parts of Great Britain; Particularly the High-Lands of Scotland*, 2 volumes, (London, 1789).

²¹² Christine Clearkin, 'The Revd William Gilpin (1724-1804): Artist and man of his age', *British Art Journal*, vol. 19 (2018), pp. 76- 84.

²¹³ Gilpin, *Observations on the River Wye*, p. 1.

pleasing', the grounds laid out with little beauty and the walks 'ill contrived'.²¹⁴ He was more positive about the river Tummel near Pitlochry:

A broad sand-bank stretched before the eye, as a second distance, round which the river formed an indented curve; its banks were well decorated; and the view was closed, in the fashion of Scotch landscape, with beautiful mountains.²¹⁵

Gilpin's style and his guide to landscapes may help to explain the use of picturesque language in some accounts. For example, Walter Anderson, minister at Chirnside in Berwickshire described the river Whiteadder in these terms:

In one station, it glitters between the stems of the trees, reflecting intermissive and tremulous beams of light. In another, it shows, like a bright edging or half coronet, to their green tops. In a third, where the trees do not interpose, it is thrown into a shining curve. The high banks are seen, in contiguity to those of Blackadder-water. The plantation and enclosures around Allanbank house conspire with those of Blackadder to complete the vista, and shut the scene.²¹⁶

The similarity of language with Gilpin is striking, in the descriptions of the curves in the river and how the scenery is enclosed by high riverbanks. Gilpin's guides were published in the decade before the OSA, and he was at his most popular in the 1790s. when the accounts were published.²¹⁷ While none of the ministers mentioned Gilpin by name there are so many examples of picturesque language in the OSA that it is likely that Gilpin was an influence. Ministers were certainly interested in improvement and natural history, but the use of the picturesque descriptions suggests that some were aware of fashions in travel writing and happy to adopt new styles when writing about their parishes. Gilpin was also a clergyman, and this may have influenced some ministers in adopting his style.²¹⁸

There were a smaller number of accounts that used terms such as 'sublime' or 'romantic' to describe landscapes. The concept of the sublime has been subject to much discussion and study, and it goes beyond the scope of this study to explore it in

²¹⁴ Gilpin, *Observations on the High-Lands of Scotland*, pp. 158-159.

²¹⁵ Gilpin, *Observations on the High-Lands of Scotland*, p. 132.

²¹⁶ Chirnside, County of Berwick, OSA, vol. XIV, 1795, p. 6.

²¹⁷ Andrew Ballantyne, 'The Picturesque and its development', in Paul Smith and Carolyn Wilde, (eds.) *A Companion to Art Theory*, (Oxford, 2002), pp. 116-124.

²¹⁸ Gilpin was a cleric in the Church of England whose background and latitudinarian views were similar to those of the Moderate clergy in the Church of Scotland. A study by Robert Mayhew suggests that this tradition helped shape his writing on the natural environment; see Robert Mayhew, 'William Gilpin and the latitudinarian picturesque', *Eighteenth-Century Studies*, vol. 33 (2000), pp. 349-366.

detail. Whereas the 'picturesque' in the accounts generally celebrates landscapes that had been created or 'improved' by human activity, the terms 'sublime' or 'romantic' were more usually applied to landscapes that were more remote, rocky and less obviously managed. The term 'sublime' is mentioned in twenty seven accounts, an example being the description of the Isle of Jura by Francis Stewart:

As there has been no actual survey, the length and breadth are not exactly ascertained. The appearance of the island is very romantick, and calculated to raise sublime emotions in the spectators soul. There is a ridge of towering mountains, which run from S. to N. along the W. side, terminating the prospect from the continent, and very often covered with clouds and darkness. These mountains are 4 in number.²¹⁹

The example is of interest it mixes an enlightenment concern for accurate measurement with romantic description. Francis Stewart, educated at Edinburgh University, was relatively new to the island where he was minister from 1791 to 1794 and may have brought a new sensibility to the landscape. In some accounts, a mixture of improvement, romantic description and earth history can all appear. In Glenurchy and Inishail, in Argyll, Joseph MacIntyre described the new road through the Pass of Brander:

From the inn of Dalmaly, to the bridge of Aw, a very judicious alteration in the line of public road has been lately made, at the expence of above £400. Sterling. This beautiful line winds, for miles, through woods and dells, presenting such varied and agreeable views of water, of islands, of towering mountains, and sloping hills, as give an uncommon grandeur and sublimity to the landscape. Part of the road lies through a narrow defile, "amidst such irregularities of nature, such deep chasms, and such impending rocks, as indicate some vast convulsions of the earth, to have happened at some remote period of time."²²⁰

The Pass of Brander was a route used by travellers exploring the highlands and their impressions may have coloured MacIntyre's description. MacIntyre did not name the source of the quotation about convulsions of the earth and its origin remains uncertain. Mentioning 'some remote period of time' suggests that he was aware of the debate on the history of the earth. As noted above, John Playfair remembered being overwhelmed by the experience of seeing the rocks at Siccar Point with Hutton, and how the rocks suggested the enormous age of the earth. It is easy to understand

²¹⁹ Jura, County of Argyle, OSA, vol. XII, 1794, p. 318.

²²⁰ Glenurchy and Inishail, County of Argyle, OSA, vol. VIII, 1793, p. 345.

in these circumstances how the language of the sublime helped ministers express their feelings when contemplating the age of the earth. James Robertson at Callander provided another example:

When you enter the Trosachs, there is such an assemblage of wildness and of rude grandeur, as beggars all description, and fills the mind with the most sublime conceptions. It seems as if a whole mountain had been torn in pieces, and frittered down by a convulsion of the earth; and the huge fragments of rocks, and woods, and hills, scattered in confusion.²²¹

Tom Furniss has suggested that the account by Robertson helped to initiate tourism in the Trossachs. It influenced, among others, Dorothy Wordsworth, who, Leask and Furniss note, was aware of Robertson's account when she wrote a description of the Trossachs in her *Recollections of a Tour Made in Scotland in 1803*.²²²

Sometimes a landscape could be either picturesque or sublime depending on the conditions. James Arkle at Castletown in the county of Roxburgh managed to include both in his description of the Blackburn but concluded by returning to rational measurement.

Sometimes the river shoots over a perpendicular rock, in one unbroken sheet of water, forming a beautiful cascade; at other times it is darted over tremendous precipices, and rages furiously among the huge masses of the rock below. In this wild and romantic vale, nature appears in various forms, now beautiful, then awful, sometimes sublime, and frequently terrible. The author of this account measured the principal falls. One is 27 feet perpendicular in height, another 31 1/2; the breadth of the rock over which it falls, 36; a third is 37 1/2 in height, and 20 feet wide.²²³

The rugged landscapes of the highlands and islands offered ministers the best opportunities to make expressions of the sublime, as at Glen Nevis as described by Alexander Fraser:

The windings of the river, -the verdure of the trees, -the wildness of the rocks, -the terrific aspect of the hills, -the mist, flying swiftly on their tops, -the clouds, rolling along with velocity, -the lonely situation, remote from human eye, -every thing conspires to make this fall of water, one of the grandest objects in nature.²²⁴

²²¹ Callander, County of Perth, OSA, vol. XI, 1794, p. 577.

²²² Leask, *Stepping Westward*, p. 211; Tom Furniss, 'Plumb-Pudding Stone and the Romantic Sublime: the Landscape and Geology of the Trossachs in the Statistical Account of Scotland (1791-9)' in *Romantic Localities*, no. 19 (2015), pp. 51-65.

²²³ Castletown, County of Roxburgh, OSA, vol. XVI, 1795, p. 78-79.

²²⁴ Kilmalie, County of Inverness, OSA, vol. VIII, 1793, p. 422.

The Atlantic Ocean similarly suggested awesome power to Allan MacQueen in North Uist:

In bad weather, when the wind blows upon this part of the coast, the sea swells to a prodigious height, and rolls with inexpressible violence against the shores, exhibiting a prospect awfully grand beyond description.²²⁵

These romantic elements stand in contrast the measured utilitarian descriptions that comprise most of the writing in the accounts, but they demonstrate that some ministers shared the new fashions of picturesque and romantic writing.

The OSA reveals that ministers were committed to ‘improvement’ but, at the same time, some embraced picturesque, sublime and romantic descriptions of landscape. The timing of the accounts suggest that Gilpin may have been a significant influence, along with other travel writers. At least one minister, James Robertson at Callander, contributed to the romantic reputation of the highlands in his description of the Trossachs. The evidence suggest that ministers were part, of and contributed to, changing attitudes towards landscapes in the 1790s.

Conclusion to Chapter Seven

The accounts discussed in this chapter provide substantial evidence for ministers’ interest in and knowledge of the physical environment. The number of references and the range and length of the descriptions of the physical environment are impressive. Climate and the weather, minerals, landforms, rivers and coasts are described in detail in many accounts. Ministers’ knowledge of soils and their understanding of the variety of soils across a parish and the implication for farming is remarkable. Equally impressive is their confidence in discussing how soils might be improved and the advice some seemed happy to offer to farmers.

Almost uniformly ministers were committed to improvement both in relation to agriculture and industry. They were less aware, or less prepared to comment on the pollution associated with the iron and coal industry. Ministers were fascinated by the new technology of coal mines and by carboniferous geology. The evidence of geological strata from the mining industry gave some ministers a good understanding

²²⁵ North Uist, County of Inverness, OSA, vol. XIII, 1794, p. 302.

of the geology below their parishes. The one significant discussion of the hazards associated with mining, from Leadhills, is exceptional in its tone and its content.

There is a general admiration in the OSA of landowners and entrepreneurs making the changes, many of whom are identified and praised but much less detail on the lives of working people few of whom, if any, are named. Ministers identified more closely with the elite rather than with the poor of their parish.

A substantial minority of ministers demonstrated their interest in learning about the natural environment for its own sake and were aware of developments in natural history and natural philosophy. A few used a thermometer and barometer to take recordings of the weather, with a handful keeping detailed records. Although no minister had the expertise or insight of James Hutton there are many accounts that suggest that some ministers were aware of the debates about the history of the earth and its landforms. The accounts suggest that many ministers accepted the Neptunian or diluvial theory of earth history, which stressed the importance of water in shaping landforms. No minister directly addressed the question of the age of the earth, but several discussed the role of heat in forming rocks, or the 'convulsions of the earth' that may have shaped landforms. A few ministers questioned 'theories of the earth' without mentioning Hutton, but none appeared shocked or horrified, and none asserted the literal truth of the creation story in Genesis.

The writings on the picturesque and sublime form an interesting contrast to the detailed descriptions of rocks, minerals and soils. Stepping back from its detail to look at the landscape, a few ministers embraced fashionable descriptions. The references to sublime and romantic landscapes are significant in suggesting that, among a few ministers, a new understanding of 'wild' places was emerging, in contrast to most accounts that refer to upland and other unproductive places as waste. The accounts were written at a time when attitudes towards the 'wild' were changing and the evidence of the accounts is that some ministers were influenced by these changing attitudes.

Chapter Eight: Minister Naturalists

This thesis has already demonstrated that Church of Scotland ministers were interested and knowledgeable about the natural environment. The previous two chapters have described the breadth of interest among ministers across a range of environmental subjects. The purpose of this chapter is to examine a small number of ministers whose expertise qualifies them for the title of 'minister naturalists'. In doing so it draws on the evidence in the OSA but also includes other sources. All the ministers discussed in this chapter wrote parish accounts, but some also published other works on environmental subjects which provide additional information and insights on their interest in the natural environment. Thirty five ministers have listed as 'minister naturalists' in appendix one with brief biographical summaries and notes on their environmental interests. From this long list a short list of six ministers has been identified whose interests are described in this chapter in more detail. Many more ministers made important contributions and deserve to be better known but there is insufficient space to accommodate them all in detail.

Appendix one gives brief details of the thirty five ministers, their parishes and, if known, their university education. The list demonstrates the wide range of subjects that interested ministers including topography, soils and landscapes; rivers, hills and moorlands; woodlands and plantations; rocks, minerals and fossils; and the coast, its birds and sea life. It is representative of those ministers whose work has been described elsewhere in this thesis, not a definite list of all minister naturalists writing in the OSA and a definitive could be significantly longer, such was the level of interest and expertise in the accounts. Of the thirty five ministers identified in the table their first place of university education was as follows: Edinburgh (6), Glasgow (13), King's College Aberdeen (3), Marischal College Aberdeen (4), St. Andrews (3), and not recorded (6). These figures should be treated with caution given the selective nature of the list, but it is striking that the largest single group were those educated at Glasgow. David Wilson's study of Glasgow University claimed that Glasgow was preeminent in the teaching of natural philosophy during the middle of the eighteenth

century, and this may help account for the number of minister naturalists from Glasgow in the list.¹

Two important ministers have been excluded from this chapter on the grounds that they are both well covered in the literature elsewhere: John Walker and John Playfair. Walker (1731-1803) was parish minister at Moffat and Colinton and was also Professor of Natural History at Edinburgh University. Walker's role as a researcher and teacher has been noted above with a summary of the literature on his work.² Walker was a leading natural historian whose teaching influenced a generation of students, including many church ministers, as discussed in chapter three and in the appendix. While acknowledging his importance, within the limited space available in this thesis, priority has been given to those ministers who have received far less publicity and whose achievements also deserve recognition. John Playfair (1748-1819) was a parish minister at Liff in Angus (1773-1783). Unlike Walker, who continued to hold university and parish ministerial posts, Playfair devoted himself thereafter to an academic career at Edinburgh, first as a professor of mathematics and then of natural philosophy. Walker published little, but Playfair was a prolific writer whose works were compiled and published in four volumes after his death.³ He is remembered as Hutton's publicist, whose *Illustrations of the Huttonian Theory of the Earth* encouraged a wider understanding of the *Theory* in the early nineteenth century and has drawn him to the attention of a wider audience.⁴

Of the 35 ministers listed in the appendix, six are identified in the table 33. These are ministers who made outstanding contributions to the study of natural history and whose work deserves to be better known. Three of these ministers published works of natural history that develop the descriptions they contributed to the OSA. Patrick Graham's *Sketches of Perthshire*, Robert Rennie's *Essays on Peat Moss*, and David Ure's *History of Ruther Glen and East Kilbride* help to identify them as important

¹ David Wilson, *Seeking Nature's Logic: Natural Philosophy in the Scottish Enlightenment* (University Park, 2009), p. 69.

² A list of references to John Walker can be found in chapter three.

³ James Playfair (ed.), *The works of John Playfair with a memoir of the author*, 4 volumes (Edinburgh, 1822). Biographical details are in Jack Morrell, 'John Playfair (1748–1819), mathematician and geologist' ODNB, <https://www.oxforddnb.com/>. Playfair is also celebrated by a monument on Calton Hill in Edinburgh, see <https://canmore.org.uk/site/116624/edinburgh-calton-hill-city-observatory-playfairs-monument>.

⁴ John Playfair, *Illustrations of the Huttonian Theory of the Earth* (Edinburgh, 1802).

minister naturalists. Similarly, James Meek’s unpublished Journal offers additional evidence of his commitment to meteorological observation.

Table 33: Outstanding minister naturalists

Minister (parish)	Principal interests
William Bennett (Duddingston)	Botany, especially aquatic flora
Patrick Graham (Aberfoyle)	Topographical description, geomorphology, earth history, flora and fauna
James Meek (Cambuslang)	Meteorology
Robert Rennie (Kilsyth)	Topography, mineralogy, the natural history of peat bogs, earth history
John Stuart, (Luss),	Botany, zoology
David Ure (East Kilbride)	Botany, zoology, mineralogy, palaeontology

William Bennet of Duddingston (1763-1805) and the Aquatic Flora of Duddingston Loch

William Bennet was minister at Duddingston near Edinburgh from 1786 until his death. The son of the minister at Polmont he was licensed by the Presbytery of Linlithgow and was minister at Duddingston from 1786. The Fasti does not record his university education.⁵ His account of Duddingston contains the most detailed description of the natural environment of all the parishes in the county of Edinburgh.⁶ The account is twenty six pages long and of the 816 lines of text, 333 (40%) are under environment subject headings. The section titled ‘Minerals, Vegetables, Animals’ is of 126 lines and includes details of the geology and fossils at the coast at Portobello, species of sea fish caught off the coast and the botany of Arthur’s Seat. His description of the minerals of the parish includes mention of limestone, whin and basalt and also the appearance of strata at the coastline. He described the coal measures and other less well known resources: ‘Petroleum, or fossil pitch, and manganese in small quantities, have also, been found in the crevices of the free-stone quarries.’⁷ The fossil remains of ancient plants also caught his attention: ‘Upon the sea coast, in the interstices of rocks and stones, curious and rare specimens of petrified plants and trees have been found now known to be indigenous in tropical regions only; a circumstance which as it has sometimes occurred so unaccountably in northern climates, has given rise to so much ingenious speculation, and to so

⁵ Fasti, vol. I, p.20.

⁶ Duddingston, County of Edinburgh, OSA, vol. XVIII, 1796, pp. 358-384.

⁷ Duddingston, p. 372.

many extravagant theories.’⁸ Bennet is aware that the fossil remains resemble species now only found in the tropics but is sceptical about attempts to explain why such species should be found in the north.

Bennet referred to Lightfoot’s pioneering account of Scotland’s flora, suggesting it underestimated the number of plant species in Holyrood Park.⁹ Of particular interest is the list of species Bennet identified growing in and around Duddingston Loch. He distinguished between species that he found in the loch, which he called *inundatae* and those around its margins which he termed *palustreae*. The species he identified are listed in the table below. Each item in the list has been checked against a modern source, the National Biodiversity Network (NBN) Atlas for Scotland which maps the current distribution of species in Scotland.¹⁰ The NBN Atlas confirms that all the species noted by Bennet are found in the area today. The second column of the table gives the name of species listed by Bennet. Where the species name has subsequently been revised this is shown in the column on the right, along with the common name in English.

Table 34: Bennet’s list of plants in Duddingston loch

No.	Name	Comments (with modern spelling if different)
Inundatae: ‘Dudingston loch alone affords a curious variety of indigenous plants. Of these, the most remarkable among the submersed species, or, as they are technically termed, the Inundatae.’ ¹¹		
1	Marestail, or <i>Hypuris vulgaris</i>	Now classified as <i>Hippuris vulgaris</i> , a shallow water marginal native pond plant native to Scotland
2	<i>Potamogeton natans</i>	Broad-leaved Pondweed, now classified as <i>Potamogeton natans</i> . P. is a genus of aquatic plants often known simply as ‘pondweed’.
3	<i>P. perfoliatum</i>	Perfoliate pondweed, now classified as <i>Potamogeton perfoliatus</i>
4	<i>P. lucens</i>	Shining pondweed, now classified as <i>Potamogeton lucens</i>
5	<i>P. crispum</i>	Curled pondweed, now classified as <i>Potamogeton crispus</i>
6	<i>P. densum</i>	Opposite-leaved Pondweed, now classified as <i>Groenlandia densa</i>

⁸ Duddingston, p. 372.

⁹ Duddingston, p. 373; John Lightfoot, *Flora Scotica* (London, 1777).

¹⁰ The National Biodiversity Network Atlas of Scotland is an authoritative source of biodiversity data for Scotland, containing maps, descriptions and synonyms of species collated from a number of sources, see <https://scotland.nbnatlas.org/>.

¹¹ Duddingston, p. 373.

No.	Name	Comments (with modern spelling if different)
7	<i>P. graminium</i> , etc.	Various leaved pondweed, now classified as <i>Potamogeton gramineus</i>
8	<i>Stratiotes aloides</i>	Water soldiers, a relatively rare plant but may occur at Duddingston
9	<i>Myriophyllum spicatum</i>	Spiked water-milfoil
10	<i>Ranunculus aquatilis</i>	Common water-crowfoot
Palustrae: 'Among the marshy, which are also often inundated, technically termed the Palustrae.' ¹²		
No.	Name	Comments
11	Reed-grass	Common Reed <i>Phragmites australis</i> ?
12	<i>Arundo phragmitis</i>	A synonym of <i>Phragmites australis</i> subsp. <i>australis</i> ¹³
13	<i>Scirpus palustris</i> ,	Common spike rush, now classified as <i>Eleocharis palustris</i>
14	<i>Menianthes trifoliata</i>	Bogbean, referred to as 'trefoil' by Bennet. Now classified as <i>Menyanthes trifoliata</i>
15	<i>Hydrocotyle vulgaris</i>	Marsh pennywort
16	<i>Sium angustifolium</i>	Water parsnip, now classified as <i>Berula erecta</i>
17	<i>Parnassia palustris</i>	Grass of Parnassus
18	<i>Triglochen palustre</i>	Marsh arrowgrass, sometimes classified as <i>Triglochin palustris</i>
19	<i>Alisma plantago</i>	Water plantain, now classified as <i>Alisma plantago-aquatica</i>
20	<i>Epilobium palustre</i>	Marsh willowherb
21	<i>E. hirsutum</i>	Great willowherb
22	<i>Polygonum amphibium</i>	Amphibious bistort, now classified as <i>Persicaria amphibia</i>
23	<i>Lychnis flos cuculi</i>	Ragged robin, now classified as <i>Silene flos-cuculi</i>
24	<i>Geum rivale</i>	Water avens
25	<i>Comarum palustre</i> ,	Marsh cinquefoil, now classified as <i>Potentilla palustris</i>
26	<i>Ranunculus lingua</i>	Greater spearwort
27	<i>R. sceleratus</i>	Celery-leaved buttercup
28	<i>R. hederaceus</i>	Ivy-leaved crowfoot
29	<i>Caltha palustris</i>	Marsh marigold
30	<i>Cardamine pratensis</i>	Cuckooflower
31	<i>Sisymbrium aquaticum</i>	Watercress, now classified as <i>Rorippa nasturtium-aquaticum</i>
32	<i>S. amphibium</i>	Marsh yellow-cress, now classified as <i>Rorippa amphibia</i>
33	<i>Tussilago farfara</i>	Coltsfoot
34	<i>Petasites</i>	Butterbur (four species in Scotland)
35	<i>Bidens</i>	Bur marigold species
36	<i>Sparganium erectum</i>	Branched bur-reed
37	<i>S. natans</i>	Small bur-reed
38	<i>Equisetum palustre</i>	Marsh horsetail
39	<i>E. fluviatile</i>	Water horsetail

¹² Duddingston, p. 373.

¹³ Plants of the World Online, Royal Botanic Gardens, Kew:
<https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:390920-1>.

The list produced by Bennet is remarkable for several reasons. First, compiling such a detailed list points to his detailed knowledge of the flora in and around the loch. Second, he was familiar with the Linnaean system of classification and used it effectively, indicating a good grasp of botanical identification. The accuracy of his identification is supported by the evidence from the NBN atlas. Bennet was not unique in using the Linnean system when describing the flora and fauna of the parish. Other ministers also used Linnean notation suggesting it was understood among ministers with an interest in natural history by the 1790s. A melancholy note in the life of Bennet is his death by drowning in Duddingston Loch in April 1805. The *Fasti* does not record if this was by accident or by intent.

Patrick Graham of Aberfoyle (1750-1835) and Landscape Formation in Perthshire

Patrick Graham, the son of the schoolmaster in Aberfoyle, was educated at Glasgow University where he graduated with an M.A. in 1776 and where he was honoured with a D.D. in 1795. He was minister at Aberfoyle from 1787 until his death. Graham was described by Walter Scott as a man ‘whose urbanity in communicating information on the subject of national antiquities is scarce exceeded by the stores of legendary lore which he has accumulated’ and the account indeed suggests that his range of interests was wide.¹⁴ The account commences with a description of the topography of the parish, its mountains, lochs and the River Forth. This includes four pages of description on the stratigraphy and geomorphology of the parish. He noted that the line of the Grampian mountains ‘from the Girdleness in Aberdeenshire, to the hill of Ardmore, on the Frith of Clyde’ passed through the parish, in effect describing the line of the highland fault that divides the older rocks of the highlands from the younger rocks of the lowlands.¹⁵

Graham identified a stratum of conglomerate on the eastern side of the mountains:

the rock consists of rounded or oval pebbles, from the size of a pigeon's egg, to masses of 9 or 10 inches in diameter, which contain in them much iron ore, and

¹⁴ *Fasti*, vol. IV, p. 336.

¹⁵ Aberfoyle, County of Perth, OSA, vol. X, 1794, p. 115. A recent field guide confirms the presence of Ordovician limestones and Old Red Sandstone conglomerates; see B.J. Bluck and James D. Lawson, revised by Mike Keen, *A Geological Excursion Guide to the Aberfoyle Area* (Glasgow, 2020), p. 1.

which seem, at some period, to have been loose and detached. They are now, however, strongly cemented into the body of the rock by a substance of a calcareous nature.¹⁶

To the west he described a limestone outcrop:

...disposed in nests, as the workmen term it, and not in strata of a regular dip; and no where, in this neighbourhood, is limestone found, except in this line of the Grampian Mountains, and uniformly on the west side of the rock. The limestone is blue, with beautiful veins of white.¹⁷

The limestone was associated with granite and slates which, he noted, were too far from navigable water to be worth quarrying. From this introduction he moved on to consider what the landscape revealed about the earth's history and the role of water in shaping landforms. He observed that the district: 'is one of those which may furnish the naturalist with a proper field for decisive conclusions with regard to the original structure, and the subsequent changes of our terrestrial globe'.¹⁸ The parish formed part of the catchment of the River Forth, flowing from the mountains towards Stirling in the east. The river: 'losing itself, from time to time, in extensive lakes, at length bursts out by a narrow passage into a great plain, seems to promise a fair exhibition of the real effects that are to be attributed to running water, that universal agent, as some modern philosophers account it, in changing the superficial aspect of our earth.'¹⁹

This explanation is consistent with standard diluvial theory described in chapter seven. It was widely understood that rivers erode material from high ground and transported it to low ground. John Walker, for example, referred to the action of rivers in his lectures on geology, noting how the river Nile transported material that was deposited in its delta.²⁰ As noted in chapter seven above, several other ministers described the impact of river erosion and deposition in their accounts, particularly in highland parishes. Hutton is nowhere mentioned in the account but it is likely that he was one of the 'modern philosophers' that Graham had in mind. Graham went on to

¹⁶ Aberfoyle, p. 115.

¹⁷ Aberfoyle, p. 115.

¹⁸ Aberfoyle, p. 116.

¹⁹ Aberfoyle, p. 116.

²⁰ John Walker, *Lectures on Geology* (ed.) Harold Scott (Chicago, 1966), pp. 156-158.

question whether the river and others like it in the mountains had the force or power to shape the landscape in the way that Hutton was claiming:

In contemplating this, and similar scenes which occur everywhere in the Highlands, one cannot help observing, that, had the great excavations between the mountains been occasioned by the gradual attrition of the running waters, the effects produced must have been much more considerable, than the formation of a few scanty spots of fertile soil in the subjacent valleys.²¹

He then referenced Jean-André Deluc, a critic of Hutton, who had also questioned Hutton's claims on the power of water.²² Following Deluc, Graham went on to suggest that if the power of water was as great as Hutton suggested then surely, over time, it would have filled the lochs of the parish with material washed down from the mountains: 'In them therefore, the sediment must have first subsided; yet it is not observed that the lapse of ages diminishes either their depth or their extent.'²³

Graham concluded that effect of water is 'proportionately small' and could not explain the complex landforms of the parish. He argued that landforms could only be understood with reference to more ancient events and that: 'there is room to believe that the revolutions on the surface of our globe must have been more numerous, and more considerable than they now are.'

This suggests that Graham accepted that the earth was of great antiquity but that landforms had been shaped mainly by massive forces of a previous age. He explored this idea further with reference to landforms near the Forth further downstream, a series of grass covered ridges of sand and gravel at Nether Donnans farm. Setting aside an explanation that they were of Roman origin he suggested that they represented a former course of the river, that over time had settled into a new channel nearby: 'The accessions of soil from the mountains have been gradually diminished by the consolidation of their strata. The streamlets that run down from the hills have hollowed out a regular channel for themselves.'²⁴ In summary, he believed that landforms had been shaped in the past, by forces that were more dynamic, but were now less energetic, and that the landscape had settled into a stable configuration.

²¹ Aberfoyle, p. 116.

²² Aberfoyle, p. 116.

²³ Aberfoyle, p. 117.

²⁴ Aberfoyle, p. 118.

Graham went on to describe the flora and fauna of the parish, including a footnote listing forty five rare plants with examples of their medicinal uses. He described bird species in the parish including divers, falcons and ospreys. He noted action to deal with one nuisance species: 'The black eagle builds in some of the more inaccessible rocks; but, as great pains have been taken to destroy the species, it is now rare.'²⁵ As noted in the section of vermin in chapter five, birds of prey were commonly described as 'vermin' by ministers in the OSA.

Graham's interest in landscape and earth history can be explored in more detail in his guidebook of 1806, *Sketches of Perthshire*.²⁶ The *Sketches* offers a selection of itineraries through the county and contains a substantial section on geology.²⁷ In this section Graham returned to the comments made in the parish account and develops them in more detail. It is clear from this chapter that he is familiar with the literature on geology and earth history as he refers to Buffon, Linnaeus, Kirwan, Walker, and Deluc. Strangely, he does not mention Hutton. In the *Sketches* he described the landscape above Callander and its three lochs: Katrine, Achray, and Vennachar. Taking his lead from Deluc he developed the argument set out in the parish account. He described the mountains:

...from 1000 to 3000 feet in height, pouring down innumerable streams and rivulets, which all discharge themselves into the Teith. Had the immense chasm of which this valley consists been occasioned by the attrition of the streams that traverse it, the beds of the lakes would long ago have been filled up with soil, and a quantity of alluvial earth, proportioned to that which had been washed down from the mountains, would somewhere be found.²⁸

It may seem strange that the evidence of glaciation, which is ubiquitous both in the mountains of Scotland and Switzerland, did not occur to Graham or any of the other participants in this debate, but it would not be until Louis Agassiz (also from Switzerland) visited Scotland in 1840 and pointed to the evidence of glaciation, both near Edinburgh and in the highlands, that the importance of ice in shaping the landscape was recognised.²⁹ The erosive force of glaciers shaped the glens of the

²⁵ Aberfoyle, p. 119.

²⁶ Patrick Graham, *Sketches of Perthshire*, second edition (Edinburgh, 1812).

²⁷ 'Geological hints applicable to this district' in Graham, *Sketches*, pp. 77-91.

²⁸ Graham, *Sketches*, p. 90.

²⁹ Gordon L. Davies, 'The tour of the British Isles made by Louis Agassiz in 1840', *Annals of Science*, vol. 24 (1968), pp. 131-146.

highlands and glaciers dragged and deposited large amounts of debris creating the moraines, drumlins, and till that covers much of lowland Scotland. The resulting disturbance of drainage created countless lochs across the landscape. Deluc and Graham were correct in pointing out that many landforms such as lacustrine deltas were of recent origin even if they did not fully understand the mechanism of their creation.

Graham's publications provide evidence that he was familiar with contemporary debates on the development of landforms and earth history. While he did not quote Hutton, he refers to one of Hutton's most prominent critics, Deluc, whose arguments he appeared to follow. Graham's observations were not an unthinking response of shock or horror, but a reasoned commentary that followed Deluc's criticisms of Hutton's claims in the *Theory of the Earth* about the power of water to erode and transport material from the mountains to the sea. If the burns flowing from the mountains could only create small deltas in the lochs, how could they have had the power to reduce mountains? The evidence from the landscape suggested to Graham a great event in the past had shaped landforms, which he believed had been a flood. Neither he, Hutton, nor Deluc imagined that ice was the principal agent of change.

James Meek of Cambuslang (1742–1810): Recording the Weather

Meek was educated at the University of Glasgow and was minister at Cambuslang from 1774. A prominent member of the moderate party, he was Moderator of the General Assembly (1795) and received a D.D. from Glasgow in 1781.³⁰ He was elected an FRSE in 1805.³¹

The account of Cambuslang is of thirty four pages and ranges over a wide range of environmental issues. Meek began with the landscape and soils of the parish which he described as 'beautifully diversified with hill and dale' and which contained three different soil types: 'Upon the ridge ... and the adjacent fields, the soil is thin and gravelly. Along the banks of Clyde, it is partly a light loam, and partly a light sand; but by far the most common, is a clayey soil, with a till.'³² He noted the regularity with

³⁰ Fasti, vol. IV, p. 238.

³¹ FFRSE, p. 637.

³² Cambuslang, County of Lanark, OSA, vol. V, 1793, p. 242.

which the Clyde was prone to flood, on average three or four times a year: 'In the flood of 12th March 1782, the greatest remembered, or on record, it rose 20 feet above the bed of the river, and 1 foot 6 inches higher than a memorable flood on the 24th September 1712.'³³ He described the coal measures, noting that the strata in the parish dipped to the north and that the angle of the strata was steepest closest to the river. He suggested that the coal works were among the oldest in Scotland and noted with interest that a steam engine had been installed in 1787 to permit deeper mining.³⁴

In common with ministers in some parishes around Glasgow he described the landscape in picturesque terms, and he also wrote in praise of the city:

Amidst the amazing variety of objects, which here present themselves to the eye of the spectator, the most striking are, the windings of the river, and its banks adorned with villages, towns, and gentlemen's feats; the extensive woods and plantations about Hamilton; the magnificent ruins of Bothwell castle; but above all, the large and populous city of Glasgow, with its numerous spires and venerable cathedral.³⁵

Proximity to the Glasgow gave farmers the advantage of a source of manure. Meek described the trade in manure and the costs of carting it to farms in the parish: 'Glasgow dung is the principal manure employed for raising a wheat crop. A cart of dung in Glasgow, by the time it is carried to the dunghill without the town, costs 1s. 6d.; but this cart is so large, that two of them make three of those that are brought to the country, which therefore cost only 1 s. each.'³⁶ He went on to note that 'it requires 45 carts to dung an acre of land for wheat'. Of particular interest is the detailed table (five pages) which set out the many changes that had taken place in the parish between 1750 and 1790.³⁷ He stressed that the main driver for the changes in the parish, economic, social and environmental, was the growth of Glasgow:

This and the neighbouring parishes depend, in a great measure, on Glasgow; which is the market where they sell every thing they can spare, and buy every thing they want. The state of manufactures and commerce in that city extends its influence over all the adjacent country.³⁸

³³ Cambuslang, p. 243.

³⁴ Cambuslang, p. 257.

³⁵ Cambuslang, p. 244.

³⁶ Cambuslang, p. 248-249.

³⁷ Cambuslang, p. 252-256.

³⁸ Cambuslang, p. 250.

Meek's account is an important record of the economic impact of Glasgow on neighbouring parishes. The rapid growth of the city and its economy created market for produce and supplied a growing range of consumer goods, changes that were transformative for neighbouring parishes.

While Meek wrote about many environmental issues it was his interest in recording the weather that is of particular importance. Meek was not unique in taking meteorological observations: this was an activity that had grown in popularity through the eighteenth century as part of the public culture of science.³⁹ Meek was a representative of this enlightenment activity and a significant contributor to it. He had been making daily observations since 1785 and included a summary of the data he collected in a table published in the account of the parish: 'The justest notion of the climate of this district, may, doubtless, be formed from the following abridgment of a register, kept for 7 years, (from 1st January 1785, to 31st December 1791) at Cambuslang manse, which is situated about 200 feet above the level of the sea.'⁴⁰ The table he included in the account is given in figure 9 below.

³⁹ Jan Golinski, *British Weather and the Climate of Enlightenment* (Chicago, 2007), especially chap. 3 'Recording and forecasting'.

⁴⁰ *Cambuslang*, p. 245.

Mths.	Barometer.						Thermometer.						Winds.				Weather.					
	M.	H.	G.	H.	L.	H.	M.	H.	G.	H.	L.	H.	N.	E.	S.	E.	S.	W.	N.	W.	Dry.	Wet.
Jan.	29.55	30.47	28.20				38.2	52		3			7	6	15			3			14	17
Feb.	29.59	30.65	28.48				38.9	55		13			7	4	15			2			14	14
Mar.	29.69	30.50	28.60				39.7	58		18			9	5	12			5			17	14
April	29.72	30.30	28.70				46.2	70		27			12	2	12			4			17	13
May	29.74	30.28	28.82				51.3	80		36			10	3	15			3			17	14
June	29.70	30.20	29.06				58.4	85		38			10	2	15			3			18	12
July	29.53	30.22	28.78				59.8	77		47			5	3	18			5			12	19
Aug.	29.61	30.26	28.90				59.3	77		45			7	3	18			3			14	17
Sept.	29.59	30.24	28.44				54.5	77		36			7	4	16			3			15	15
Oct.	29.51	30.48	28.38				47.8	65		26			10	4	14			3			14	17
Nov.	29.48	30.24	28.48				41.3	56		21			11	6	10			3			18	12
Dec.	29.39	30.14	28.50				37.6	54		3			9	5	14			3			15	16
	29.59	30.65	28.20				47.9	85		3			8.6	3.9	14.5			3.3			15.4	15

Figure 8: Table of meteorological observations at Cambuslang by James Meek ⁴¹

The table compressed seven years of data into a compact format. The column on the left indicates the month of the year and for each month the table presents data on air pressure, temperature, days with wind and days with rain. The air pressure is recorded in three columns showing for each month the mean height of the barometer (MH), greatest height (GH) and lowest height (LH). Temperature data was presented in the same way, with mean, high and low values recorded for each month. Winds were recorded by direction with the number of days the wind blew from each quarter of the compass recorded in four columns (NE, SE, SW and NW). The final column indicated the average number of dry and wet days in each month. The bottom row gives the summary data for the seven years. Meek described how the data was gathered:

The Barometer was every day marked at 8 o'clock in the morning, and 10 o'clock at night; and the Thermometer, not only at these times, but also at 2 o'clock afternoon; so that columns first and fourth, express the mean height between these extremes of the day.⁴²

⁴¹ Cambuslang, p. 245.

⁴² Cambuslang, pp. 245-246.

Meek was not the only minister who recorded details of the weather, but his methods were meticulous and his persistence impressive. Recording the range of values and presenting them around the mean value suggests a sophisticated grasp of the data and how it could be managed. He, or others on his behalf, continued to collect data until 1809, recording the readings in a journal and register.⁴³

Meek's Journal and Register

The manuscript of the journal and register is in a bound volume with a brief note of introduction written by Meek's daughter Frances, who donated the volume to Glasgow University Library in 1836. The MS appears to be a fair copy, neatly set out and written in one hand throughout, with few changes or corrections. It consists of two parts. The first records the weather from January 1785 to December 1792. The second part begins in January 1793 and presents the daily data in slightly simpler form, with readings for barometer and thermometer taken only once a day rather than three times daily for the earlier period. In April 1809 the MS breaks off without further data or commentary.

The introductory note by his daughter Frances tells us that it was written in Meek's own handwriting. However, Meek must have had assistance in collecting the data as his duties, for example as Moderator of the General Assembly in 1795, would have taken him away from Cambuslang for significant periods. As there are no noticeable gaps in the data, Meek must have had a well organised system of recorders to ensure data was collected daily, resulting in a record of remarkable consistency. The daily meteorological readings of the thermometer, barometer and wind direction are set out in tables, one month to a page, with associated notes on the weather and any related events of interest including storms, exceptionally high or low temperatures or droughts. For example, the opening page of the journal (see figure below) for January 1785 included a note that it had been 'a pretty good winter month' but that little ploughing had taken place since the harvest of 1784. In subsequent months he provided data to show that the spring of 1785 was exceptionally dry with drought conditions from April to June. At the end of June there was a brief heat wave, to which he added three pages of notes and additional tables of description.

⁴³ James Meek, 'Journal and register of the weather kept at Cambuslang 1785-1809', MS held in Glasgow University Library special collections, reference: GB 247 MS Gen 325/1.

1785	Barometer		Thermometer			Wind	Remarks.
Jan 7	S.M.	10 N.	S.M.	S.A.	10 N.	S.A.	
Sat. 1	30.10	30.	34	36	30	S.E. 1	Cloudy with some very slight showers of snow.
2	30.	30.	32	35	33	S.E. 1	Pretty clear with ☉.
3	29.93	29.90	32	34	33	S.E. 1	Cloudy with some very slight showers of snow &c.
4	29.90	29.86	34	37	33	S.E. 1	Cloudy with slight showers of sleet - The ground scarcely white here, but the snow deep to the eastward.
5	29.85	29.85	33	38	28	S.W.	Clear with ☉.
6	29.85	29.90	27	37	26	N.	☉.
7	29.90	29.96	24	34	24	E.	☉.
8	30.	29.92	29	37	39	S.E. 1	Slight shower of snow M - Some small rain thro' the day.
9	30.	30.10	45	48	45	S.W. 2	Slight showers of small rain - The ice, w ^h was fm 8 to 12 S. thick, went off by day M - No snow to be seen but in hollow places, & on hills - The frost lasted 36 days.
10	30.20	30.20	38	44	33	S.W.	Pretty clear but no ☉.
11	30.12	30.07	39	42	35	S.W.	Cloudy - Some small rain E.
12	30.	30.	34	39	34	N.W.	Close & misty with some small rain A - The ploughs not going.
13	29.97	29.95	27	36	31	S.E.	Clear with ☉.
14	29.95	29.90	30	35	31	N.E.	Brittly clear but little ☉.
15	29.92	30.	31	34	28	N.E.	Slight fall of snow M. & F. - Snow about 2 inch deep.
16	29.97	29.80	31	37	39	N.E. 1	Pretty heavy rain A - A coarse N. & wind being high.
17	29.77	29.50	46	48	45	S.W. 1	Cloudy with a few slight showers.
18	29.80	29.77	46	49	44	S.E. 1	Cloudy with some rain at N. - The ploughs beg. to go.
19	29.77	29.80	43	47	42	S.E.	Cloudy - A little rain in M.
20	29.82	29.85	42	46	42	S.E.	Cloudy - Some rain last N.
21	29.87	29.87	43	48	45	S. 2	Cloudy with some rain - a coarse day.
22	29.90	30.	45	49	47	S. 2	Cloudy & blowy?
23	30.02	30.	47	49	47	S.E. 2	Cloudy & blowy - High wind in P.M. times.
24	29.95	29.90	46	48	44	S.W. 2	Cloudy with some rain in M.
25	29.95	30.05	46	50	46	S.W. 1	Clear with ☉.
26	30.10	30.05	43	48	38	S. 2	Pretty clear with some ☉.
27	29.95	29.80	39	44	40	S. 1	Cloudy with some rain M - High wind last N.
28	29.68	29.65	41	43	34	S.W. 2	Cloudy with several pretty heavy showers.
29	29.65	29.70	31	34	31	N. 1	Ground white in M - Slight showers of hail & snow all day.
30	29.70	29.67	28	30	25	N.E. 1	Snow all day - Not deep at N. but in hollows.
31	29.90	30.10	20	30	28	S.W.	Clear with ☉ - Pleasant day.
Total	927.49	927.42	1126	1266	1120	S.E. 8	Fair days 12 - Rainy or Snowy days 19.
Mean	29.919	29.916	36.3	40.8	36.1	E. 1	A pretty good winter month - Not much high wind - Some snow and but little rain - There was very little ploughed after harvest, & there have been only 10 or 12 days of this month, on which ploughs could go - The rate of the markets at Glasgow - Best wheat 19 shil 7 ⁰ boll - Best oatmeal 13 pence 7 ⁰ peck - Best bear & pease meal 9 ¹ / ₂ 7 ⁰ peck.
G. H.	30.20	30.20	47	50	47	S. 4	
L. H.	29.70	29.65	20	30	24	N.W. 2	
						N.W. 1	
						N.W. 2	

Figure 9: Opening page of Meek's Journal and Register, January 1785⁴⁴

All changed in July 1785 with hail and thunder followed by very wet weather in September. The Clyde was in flood from 24 to 26 September and the harvest advanced slowly. With sixteen days of rain in October, the Clyde flooded again causing damage to property. Overall, he recoded, it was a poor harvest. The quality

⁴⁴Image reproduced courtesy of University of Glasgow Archives and Special Collections, Manuscripts Collection.

of the harvest affected market prices in Glasgow and Meek also noted the price of grain at the market in Glasgow on a regular basis. An example is from September 1789.

Sept. especially the last half of it has been disagreeable weather – sometimes high wind, & seldom two fair days together – Before the middle of the month the wheat was mostly got in and in pretty good order. The best new wheat in Glasgow market is now selling at 22s. per boll. The ground is now exceeding wet but Clyde tho' sometimes full, has never overflowed its banks. The roads are bad as in the depth of winter.⁴⁵

The implications of bad weather and a poor harvest were evident at the end of the century, when famine relief had to be put in place in Glasgow. In March 1800 Meek noted that soup kitchens had been set up providing food free or at very low cost and which were feeding 3,000 people daily. The end of year summary for 1800 discussed food poverty and famine relief in the city. His observations from December 1789 include reference to a minor earthquake in Comrie on 5 November, a storm that caused damaged to boats in the canal basin in Glasgow on 14 November and, the same night, a fine display of the aurora borealis.

About 10 O'clock the horizon exhibited a dull redness which grew gradually brighter, till it became light as clear moon-shine, when the appearance of the Heavens for several hours was truly grand and magnificent. The streamers quite round the horizon grew gradually paler the nearer they reached the zenith.⁴⁶

Meek's journal is one of the most remarkable examples of ministerial interest in the natural environment. It is meticulous and precise in data collection and represents a commitment that was sustained over three decades. He was using scientific instruments, the thermometer and barometer, to explore natural phenomena and at the same time was commenting in detail on the relationship between the weather, farming, flooding, food and the economy. The phrase 'practical enlightenment' can be used to describe this approach. Meek was gathering information not only because it was of personal interest, but because it could be of practical benefit. His journal demonstrated a continuing commitment to improvement through observation and description.

⁴⁵ Meek 'Journal and Register', entry for September 1789.

⁴⁶ Meek 'Journal and Register', entry for December 1789.

Robert Rennie of Kilsyth (1767-1820) and the Natural History of Peat

Rennie was educated at Glasgow University where he gained a M.A. in 1781. He was minister at Kilsyth from 1789 until his death and his account of the parish of Kilsyth is one of the longest written by any minister, at 103 pages.⁴⁷ It also contains one of the most detailed descriptions of natural history in the OSA. He started with an unflattering description of the topography and landscape:

The general appearance of the whole to a stranger is rather bare and bleak. A child may number the trees; but there are a few small copse woods. The east barony has very much the appearance of a highland district or strath. Even the west is very uneven in its surface, and much in want of planting and proper inclosures. There is not a strip of planting in the parish.⁴⁸

While the appearance of the parish was bleak, the view from the Kilsyth hills caught his imagination.

The first thing that arrests the attention, is the amazing extent of prospect that opens all around. At least part of 14, if not 16 counties, and perhaps one half of Scotland, is under the eye at one glance. Though not nearly so beautiful and variegated as that from the top of Benlomond, the view is richer, and more extensive. At a moderate calculation, the area of the whole may be 12,000 miles.⁴⁹

He went on to describe the contrasting views from the tops. To the south looking towards the Clyde: 'the whole seems one extended fertile plain; or rather, like a beautiful garden sheltered on all hands by the surrounding mountains, and divided into numberless beautiful inclosures, like the compactments of a flower garden'.⁵⁰ When fog lay in the valley: 'the hills on the north seem to raise like islands out of the main, or like the tumultuous waves of the ocean in a storm'.⁵¹

He continued with descriptions of the soil, climate and the rivers Carron and Kelvin, including an account of the work to straighten the course of the Kelvin designed to speed its flow, reduce the risk of flooding and create new pastures out of marshland. Descriptions of river pollution are rare in the accounts, but Rennie is one of the exceptions. He noted that the number of fish in the Kelvin had declined and

⁴⁷ Kilsyth, County of Stirling, OSA, Vol. XVIII, 1796, pp. 214-316.

⁴⁸ Kilsyth, p. 216.

⁴⁹ Kilsyth, p. 217.

⁵⁰ Kilsyth, p. 217.

⁵¹ Kilsyth, p. 218.

suggested possible causes. The passage of salmon up the river had been blocked by a new mill dam at Partick and there had been a decline in river water quality from agricultural runoff:

First, that there is much more lime used as manure than formerly: And it is allowed that the lees of lime are destructive both to the fish and their spawn. 2dly, there is much more flax raised. Being watered in the rills and rivulets, it pollutes the streams, and renders the water noxious to all, and fatal to many.⁵²

He also added that fishing was ‘the amusement of every idler’ and that this, particularly dragnet fishing was also contributing to the decline in fish numbers.⁵³ On a more positive note he hoped the construction of the Forth and Clyde canal would provide a new habitat ‘for all kinds of fish that delight in a stagnant muddy water.’⁵⁴

Mineralogy

‘The mineralogy of the parish would fill a volume; and might engage the attention of the natural historian for a life time.’⁵⁵

Rennie claimed not to be a mineralogist but his description of the minerals of the parish, including coal, occupies thirteen pages. He described the presence of ironstone, of which 5,000 tons were mined annually in the parish, employing over 50 workers. The ore was sent to the Carron iron works. Some of the ore was contained in balls of ironstone: ‘When broken or cut asunder, they exhibit within a great variety of square partitions; these are generally filled with white spar, which the old fossilists call septaria. But I have seen them quite empty; and beautifully excavated like a honeycomb.’⁵⁶ Quarried near the ironstone was limestone which, on close examination, revealed a display of fossils: ‘It is a conglomeration of small shells, of all sizes, from an inch diameter, till they become so small as to be invisible to the naked eye.’⁵⁷

Some of the limestone was sent to Glasgow on ‘the great canal’. There was also an inexhaustible supply of freestone for building, much of it sent to Glasgow. ‘The colour of it is exquisite; for the most part, it is a beautiful white, with a tinge of yellow. But

⁵² Kilsyth, p. 228.

⁵³ Kilsyth, p. 228.

⁵⁴ Kilsyth, p. 229.

⁵⁵ Kilsyth, p. 230.

⁵⁶ Kilsyth, p. 231.

⁵⁷ Kilsyth, p. 232.

some of it is finely variegated with brown and yellow veins, like marble.’⁵⁸ A feature of Rennie’s writing is that he could be utilitarian in describing natural phenomena while at the same time being struck by their beauty. In the freestone were the remains of fossil trees, up to twenty feet in height, with the fossil roots appearing to be buried in the coal seams below:

These are justly esteemed by philosophers objects of great curiosity. And they have furnished matter for much speculation; they resemble exceedingly a petrification: and yet the substance is not calcarious earth, but solid free-stone of similar texture with the circumjacent rock.⁵⁹

Rennie had taken one such stone into his possession: ‘In shape, colour, and appearance, it precisely resembles the trunk of a thorn tree; in so much, that every stranger at first view supposes it to be one.’⁶⁰ He described the coal seams, their location, thickness and quality and the history of their mining, which dated back to at least 1670 in the parish. Like other ministers in the coalfields, he was enthusiastic about their development and the application of steam power to extend and deepen the range of measures that could be worked. He described the flora and fauna of the parish with relative brevity, noting that there was little unusual but including a short table of the dates of arrival departure of migrant birds.⁶¹

The Natural History of Peat Moss

In the account Rennie did not dwell on the peat bogs of the upland parts of the parish but in the following decade he went on to publish a study of the natural history and potential development of peat as a resource.⁶² This publication represents a development in Rennie’s thinking from the accounts. From the length of the essays contained in it, the work of other authors he draws upon, and the hypothesis he sets out on the origin of fossil fuels, it is apparent that Rennie had studied the development of peat bogs and other fossil fuels in detail.

⁵⁸ Kilsyth, p. 237.

⁵⁹ Kilsyth, p. 238.

⁶⁰ Kilsyth, p. 238.

⁶¹ Kilsyth, p. 244.

⁶² R. Rennie, *Essays on the Natural History and Origin of Peat Moss*, vol. I (Edinburgh, 1807), vol. II (Edinburgh, 1810).

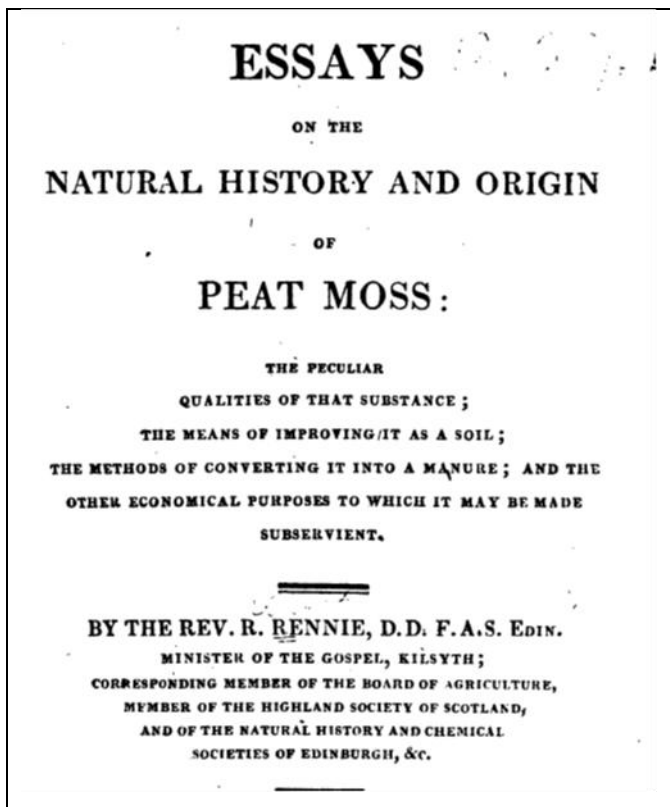
 The image shows the title page of Rennie's <i>Essays on Peat Moss</i>. The text is centered and reads: ESSAYS ON THE NATURAL HISTORY AND ORIGIN OF PEAT MOSS: THE PECULIAR QUALITIES OF THAT SUBSTANCE; THE MEANS OF IMPROVING IT AS A SOIL; THE METHODS OF CONVERTING IT INTO A MANURE; AND THE OTHER ECONOMICAL PURPOSES TO WHICH IT MAY BE MADE SUBSERVIENT. BY THE REV. R. RENNIE, D.D. F.A.S. EDIN. MINISTER OF THE GOSPEL, KILSYTH; CORRESPONDING MEMBER OF THE BOARD OF AGRICULTURE, MEMBER OF THE HIGHLAND SOCIETY OF SCOTLAND, AND OF THE NATURAL HISTORY AND CHEMICAL SOCIETIES OF EDINBURGH, &c.	The page summarises Rennie's intentions in writing the essays, which were both to explore the natural history of peat and to assess its uses in agricultural and other improvements. It also records his memberships including The Highland, Natural History and Chemical Societies of Edinburgh.

Figure 10: Title page of Rennie's *Essays on Peat Moss*

The *Essays* were published in two volumes, in 1807 and 1810. Table 35 sets out the contents of the two volumes.

Table 35: *Essays on The Natural History of Peat Moss*

Essay	Title	Contents
Volume I		
I	On ligneous plants	Reasons for decline in northern forests, how they were destroyed and the growth of mosses.
II	Of aquatic plants	Plants that contribute to growth of mosses and the variety and depth of mosses.
Volume II		
III	On the changes and combinations by which vegetable matter is converted into moss	Explores the conditions under which peat forms, including sphagnum, low temperatures and moisture.
IV	On the simple and compound substances that may be expected, and are really found in peat moss	Discusses the chemical composition of peat, including discussion of metals, acids, alkalis and other compounds.
V	On the alliance between peat, surturbrandt, coal and jet	Compares the origins of the different fuels and how they are created. 'Surturbrandt' is fossil wood. ⁶³ Argues that coal was once soft vegetable matter that has been compressed.
VI	On the alliance between peat and other bituminous substances	Discusses how vegetable matter is converted into bituminous substances
VII	On the distinguishing qualities of peat moss	Discusses its flammability, its antiseptic qualities, colour and acidity.
VIII	Of the sterility of moss in its natural state, and causes of it	Suggests a range of reasons why peat is sterile including acidity, presence of salts or bitumen or gases
IX	On the different kinds and classification of peat moss	Examines different colours, degrees of compaction, quantity of bitumen, calcareous content; argues that the different types of peat are so varied that for agricultural purposes they must be treated separately.

The essays discussed how peat could be developed as a resource: whether as a fuel, a fertiliser or for other uses. Rennie explored different aspects of the natural history of peat: its origins, how it was formed, its biological and chemical composition and

⁶³ 'Surturbrandt' is an Icelandic word for fossil wood; see Charles Hatchett, 'Observations on the change of some of the proximate principles of vegetables into bitumen', *The Philosophical Magazine*, vol. 21 (1805), pp. 147-154.

the properties of different types of peat. There had been descriptions of peat bogs in Scotland before Rennie, including those of Robert Sibbald and John Walker, and many accounts in the OSA included reference to peat resources in parishes across Scotland. John Walkers account, published in 1803, covers similar ground to Rennie's, but without Rennie's hypothetical discussion on the origins of fossil fuels.⁶⁴

In essay V, Rennie suggested that peat and fossil fuels including 'surturbrandt', coal and jet all had a common vegetable origin. This essay refers to the work of John Walker, Richard Kirwan, James Hutton, John Williams, John Playfair, John Robison, James Hall and Abraham Werner. Rennie was sceptical of many of these authors, commenting that: 'Geologists, in every other case, reason from analogy. They explain the obscure by the luminous, and the doubtful by the decisive.'⁶⁵ Rennie himself asserted that his aim was to conduct an empirical study:

The sole object of this essay is to collect facts and collate them together, and to shew to what conclusions they naturally lead. "Accumulated facts," says the illustrious Bacon, "and attentive observation alone, can imprint on any hypothesis the sacred seal of truth."⁶⁶

There are a number of points of interest about Rennie's approach. First, in the Essays, he used the term 'geologist', a term that was almost entirely absent from the OSA published in the previous decade. Second, while claiming to be an empiricist, he asserted his own hypothesis: 'The general hypothesis suggested in the following pages is, that there is a clear and decided alliance between peat, surturbrandt, coal, and jet.'⁶⁷

From the evidence of his own observations and experiments, and correspondence with others, he argued that there was a historical process that connected these minerals:

⁶⁴ T.C. Smout, 'Bogs and People in Scotland since 1600', in T.C. Smout, *Exploring Environmental History: Selected Essays* (Edinburgh 2005), pp. 99-112; John Walker, 'An Essay on Peat: Containing an Account of Its Origin, of Its Chemical Principles, an General Properties: Its Properties as a Manure, and as a Manured Soil: The Different Methods of Its Cultivation: Its Usefulness in Plantation and Gardening and as a Fuel'. *Prize Essays and Transactions of The Highland Society of Scotland*, vol. 2 (1803), pp 1-137.

⁶⁵ Rennie, *Peat Moss*, p. 370.

⁶⁶ Rennie, *Peat Moss*, p. 373.

⁶⁷ Rennie, *Peat Moss*, p. 373.

They are all links of the same chain. In other words, they all form gradations of the same process. In peat, that process is only begun; in surturbrandt, it is advanced a step farther; in coal, it is nearly complete; and, in jet it is fully accomplished.⁶⁸

He suggested a mechanism to explain this transformation:

A ruined forest, or a mass of vegetable matter, such as is contained in moss, may have been overwhelmed by a current of lava, or overrun with a bed of sand, or argillaceous or calcareous matter, or buried in the caverns of the deep by the flood...subjected to such a degree of compression, as is sufficient to consolidate it into a substance like coal.⁶⁹

He concluded by endorsing patient scientific investigation of nature to understand God's plan:

To awaken our curiosity, and excite our admiration, the Great Creator of all has thrown a veil over the commencement and consummation of every process in nature. Some of the intermediate steps may be traced. But these extremes are generally hid in obscurity. It is only by patiently tracing every intermediate link, that we can see the connection between the beginning and the end of these processes.⁷⁰

Rennie was an accomplished scholar whose essays on peat were the result of many years careful work. He discussed the rival schools of Hutton and Werner without recourse to animosity or stereotyping labels such as 'plutonism' and 'neptunism'. He argued in favour of an empirical approach but developed a hypothesis to account for the formation of fossil fuels that could be explored and tested against the evidence. He believed that scientific investigation was consistent with Christian faith, a belief that reflected the teaching of natural philosophy and natural history in Scottish universities (described in chapter two). To understand God's creation, detailed research into the natural world 'tracing every intermediate link' was right and proper. Rennie believed that there was no contradiction between faith and science, and that both could coexist in harmony.

⁶⁸ Rennie, *Peat Moss*, p. 398.

⁶⁹ Rennie, *Peat Moss*, p. 404.

⁷⁰ Rennie, *Peat Moss*, p. 399.

John Stuart of Luss (1743–1821): Traveller, Gaelic Scholar and Natural Historian

John Stuart was a Church of Scotland minister who made contributions both to understanding Scotland's natural history and to Gaelic literature. He was born in Killin in the county of Stirling, among the mountains of the southern highlands. His father, James Stuart was minister of the parish who had, before his death in 1789, completed a translation of the New Testament into Gaelic and who had started work on translating the Old Testament.⁷¹ John inherited the task and completed the work which was then published by the SPCK in 1801. His contribution to Gaelic literature also included the help and support he gave to Donnchadh Bàn Mac an t-Saoir (Duncan Ban Macintyre), an illiterate bard whose poems were published in *Orain Ghaidhealach* (Gaelic Songs) in 1768.⁷²

The *Fasti* does not record Stuart's university education, but other sources suggest it was Edinburgh, where he attended lectures by John Hope (1725-1786) Professor of Medicine and Botany in the University.⁷³ Licensed by the Presbytery of Edinburgh in 1771, he was minister at Arrochar from 1773 and then at Luss from 1776 until his death.⁷⁴ In 1772 between licensing and taking up his position in Arrochar, he joined Thomas Pennant's second tour of Scotland. With botanist John Lightfoot and artist Moses Griffith, they departed Greenock on 16 June for the Hebrides.⁷⁵ Stuart acted as Gaelic translator and was able to pursue his interest in natural history. This was noted by Pennant when they stayed with Macleod of Arnisdale. Following three glasses of rum cordialized with jelly of bilberries: 'Messrs Lightfoot and Stuart sallied out in high spirits to botanise'. The tour was described in detail in Pennant's account published in 1772 and Pennant and Stuart continued to correspond after the tour.⁷⁶

⁷¹ *Fasti*, vol. IV, p. 185. The translation of the New Testament into Gaelic was sponsored by the SPCK and published in 1767.

⁷² See <https://www.scottishpoetrylibrary.org.uk/poet/duncan-ban-macintyre/>.

⁷³ Dan Watson, 'The history of botanical discoveries around Ben Lawers', *The Forth Naturalist and Historian*, vol. 36 (2013), pp. 117-128.

⁷⁴ *Fasti*, vol III, p. 360.

⁷⁵ Thomas Pennant, *A Tour of Scotland and Voyage to the Hebrides 1772*, (Edinburgh, 1998), p. 342.

⁷⁶ Correspondence between Pennant and Stuart can be found on the Curious Travellers website: <https://editions.curioustravellers.ac.uk/letters>.

Lightfoot returned to England to publish his botanical discoveries in *Flora Scotica*, the first systematic published account of Scotland's flora. He recorded his gratitude to Stuart in the introduction:

To the Rev. Mr. Stuart jun. late of Killin in Breadalbane, now of Luss, in the county of Dumbarton, I am indebted for every assistance that ingenuity and friendship could yield. This young gentleman, a most accurate observer of Nature's works, and critically vers'd in the Erse language, and the manners and customs of his country, I had the good-fortune to share as a companion and fellow-traveller through the Highlands and Hebrides; and to him I am obliged for a great portion of the Highland botany, for many of the medical and economical, and all the superstitious uses of plants which are interspersed in this work, and to him I owe the supply of their Erse or Gaulic names.⁷⁷

John Lightfoot's praise in the introduction to *Flora Scotica* points to Stuart's importance as a Gaelic scholar and natural historian.

Stuart published little on natural history, but his contribution was nonetheless recognised by Lightfoot and by later botanists. Dan Watson has described Stuart's work on Ben Lawers where Stuart surveyed the mountain and made the first identification of a number of species, subsequently published by Lightfoot, John Hope and others.⁷⁸ Among the species on Ben Lawers whose identification Watson attributes to Stuart are Northern rock-cress (*Arabis petraea*), Black Alpine-sedge (*Carex atrata*), Hair sedge (*Carex capillaris*), Mountain avens (*Dryas octopetala*), Alpine meadow-grass (*Poa alpina*), Mountain willow (*Salix arbuscula*), Net-leaved willow (*Salix reticulata*), Downy willow (*Salix lapponum*), Sibbaldia (*Sibbaldia procumbens*), and Alpine fleabane (*Erigeron borealis*). Watson concludes that Stuart continued to contribute to the study of botany after his early work on Ben Lawers:

Stuart continued to botanise the Scottish mountains into his sixties. He also established a fine collection of arctic-alpines in the manse garden, and his home became a regular stopping off point for scientifically minded travellers on the military road on the west side of Loch Lomond.⁷⁹

This contribution is also reflected in his account of Luss.

⁷⁷ John Lightfoot, *Flora Scotica*, pp. xi-xii.

⁷⁸ Watson 'Ben Lawers', pp. 118-120.

⁷⁹ Watson 'Ben Lawers', p. 120.

The Statistical Account for the Parish of Luss

The statistical account for the parish of Luss (1796) reflects Stuart's continuing interest in natural history.⁸⁰ The section headings of the account, which is 34 pages in length, are given in the table below.

Table 36: Section headings for the parish of Luss.

Environmental subjects (with lines of text)	Other headings (with lines of text)
Situation, Extent, Erection, and Disjunctions (22) Soil, Surface, Climate, Longevity, and Diseases (34) Lake and Prospects (55) Islands (28) Phenomena (25) Rivers (7) Woods, etc. (55) Wild animals (4) Agriculture, Produce, and Imports (14) Horses and black cattle (6) Sheep (33) Minerals (19) Hints for Improvements (138)	Population (13) Farms, Rents, etc. (24) Wages, Provisions, Fuel, etc. (15) Manufactures (15) Antiquities (11) Church, etc. (9) Schools and Poor (23) Language and Character (8) Roads, Ale-houses, etc. (7) Advantages and Disadvantages (7)
Total number of lines	583
Lines on environmental subjects	440 (75%)

Compared to other accounts, Stuart devoted an unusually high proportion of text (75%) to environmental subjects. He described the erosion on the hills and how material was transported by water from the hills to the lochside: 'The principal level land lies near Lochlomond, and chiefly where the rivers discharge themselves into it, formed probably in the course of ages, by the sand and soil carried down from the higher grounds by the torrents.'⁸¹ Although he does not mention the debate on the history of the earth Stuart's description mentioned material transported by the water of Luss 'over the course of ages' to form the small area of relatively flat land at the mouth of the river on which the village of Luss now stands.⁸² In this, like Patrick Graham, he recognised that water had limited power to transport materials from the

⁸⁰ 'Luss, County of Dumbarton', OSA, vol. XVII, 1796, pp. 238-271.

⁸¹ Luss, p. 239.

⁸² Luss, p. 239.

mountains to the lochs in the parish and insufficient power to transport them to the sea.

Although manufacturing is not an environmental subject it is worth noting that Stuart shared the concern felt by many other ministers about the social impact of manufacturing. He wrote that there was a cotton mill built near Luss in 1790 'sufficiently large to give bread to such as might otherwise be in want of employment, but not to give encouragement to the vices which are so apt to abound, wherever a promiscuous multitude of people are assembled'.⁸³

He mentioned descriptions of Loch Lomond written by others, including Pennant: 'Its beauties are so well known, and have already been so well described by others, as to make any new description of them unnecessary.'⁸⁴ He noted: 'there are at present about 30 islands in Lochlomond, small and great. Most of them are finely wooded'.⁸⁵ Stuart mentioned three unusual stories associated with the loch, that it contained fish without fins, waves without wind, and a floating island. He sought to provide rational explanations for these stories: 'Vipers which abound in the islands, and are so far amphibious as to swim from one to another, are probably the fish without fins.'⁸⁶ In 1755 'the water of Lochlomond rose suddenly some feet above its former level, and was otherwise uncommonly agitated'. Stuart believed this had coincided with the earthquake in Lisbon whose tremor caused this mini tsunami. This may well be accurate as a study of the effects of the Lisbon earthquakes of 1755 and 1761 identified impacts across Europe, as far north as Loch Ness.⁸⁷ The floating island Stuart suggested was probably a 'mossy fragment, detached by the waves from the neighbouring isle of Inchmoan'.⁸⁸ His description of the loch points to his interest in a range of natural phenomena. He was not alone in describing a mini tsunami on an

⁸³ Luss, p. 264.

⁸⁴ Luss, p. 240.

⁸⁵ Luss, p. 240.

⁸⁶ Luss, p. 243.

⁸⁷ Carlos Sousa Oliveira, 'Review of the 1755 Lisbon earthquake based on recent analyses of historical observations', in Julien Fréchet, Meghraoui Mustapha, and Stucchi Massimiliano, (eds.), *Historical seismology: interdisciplinary studies of past and recent earthquakes* (Heidelberg, 2008), pp. 261-300.

⁸⁸ Luss, p. 243.

inland loch as another example was reported from Loch Tay in a letter to the RSE published in 1788.⁸⁹

He noted the habitats of different trees: ‘Oaks thrive only in dry ground. Ashes abound on the banks of the lake and near rills of water. Yews are rarely found but in the islands. Hollies are scattered through the woods, and mountain ashes often grow in elevated situations.’⁹⁰ He did not dwell on the botany of the parish as ‘other indigenous plants are nearly the same as in other parts of the Highlands, in similar soils and situations.’ He did note that a few were considered rare species ‘*isoetes lacustris*, or quillwort; *subularia aquatica*, or awlwort; *alisma ranunculoides*, or lesser water plantain; *osmunda regalis*, or flowering fern; *lichen Burgesii*, or crowned lichen, etc.’⁹¹

Stuart described woodland management in detail: ‘There are 880 acres under natural wood. Of these there are about 700 almost entirely under oak woods, which have been usually cut down once in 20 years, and at last cutting produced about 14000 bolls of bark.’⁹² He was aware that the extensive oak woods along loch Lomond were subject to careful management. ‘After the woods are cut, they are, for 5 or 6 years, carefully preserved from cattle. At that period, at 10 or 12, and at 15 or 16 years of age, they are weeded or cleared from broom, briars, or whatever else is prejudicial to them, and properly thinned.’⁹³ Towards the end of the account under ‘Hints for Improvement’ he wrote in more detail about the management of oak woods and how they might be improved by enclosure.

The longest section of Stuart’s account is that on ‘wild animals’ which, while containing only four lines of text, runs to seven pages of tables of species, as summarised in table 32.

⁸⁹ Thomas Fleming, ‘An Account of a remarkable Agitation of the Waters of Loch Tay’, *Transactions RSE*, vol. 1 (1788), pp. 200-202.

⁹⁰ Luss, p. 245.

⁹¹ Luss, pp. 245-6.

⁹² Luss, p. 244.

⁹³ Luss, p. 245.

Table 37: 'Wild animals' in the account of Luss

Table	Name of table	Number of species
I	Quadrupeds	21
II	Birds – Land birds	71
III	Birds- Water fowls	32
IV	Reptiles	6
V	Fish	13
Total number of species		143

The tables are a rich source of information about the fauna of the parish. Over 100 of the 143 entries are birds, including both land birds and water birds. For each entry Stuart gave the name in Latin, usually (but not exclusively) following the Linnaean classification; followed by the name in English and, in some cases also in 'Scotch' and Gaelic. For example, the entry for the fox is '*Canis vulpes*' (Lin.), which in 'Scotch' given as 'Tod' and in Gaelic 'Sionnach' or 'Balgaire'. The Latin entry '*Rana temporaria*' (Lin.) is listed in English as 'Frog', in Scotch as 'Puddock' and in Gaelic as 'Losgann'. 'Laverock' in 'Scotch' is the English 'Sky Lark', Gaelic 'Uiseag' and Latin '*Alauda arvensis*'. The inclusion of names in different languages indicates how two of Stuart's great interests, language and natural history, were combined in his account. This is illustrated in the figure below which shows an extract from the table of land birds.

II. B I R D S.—LAND BIRDS.				
of Lough.	Latin Names.	English.	Scotch.	Gaelic.
	* Alcedo ispida. Lin.	Kingfisher	—	—
	Certhia familiaris. Lin.	Creepers	—	Coileach dubh
	Tetrao tetrix. Lin.	Black Cock	—	Coileach-ruadh
	Lagopus alpestris. Plinii. Raii. Syn.	Grouse	Moor fowl	Tarmachan
	Tetrao lagopus. Lin.	Partridge	—	Cearc-thomann
	Tetrao perdix. Lin.	Ring dove	Pertrick	Smùdan
	Columba palumbus. Lin.	Fieldfare	Cushet dow	Liatruisg
	Turdus pilaris. Gesner.	Throats	Feltifare	Smèdrach
	Turdus musicus. Lin.	Redwing	—	—
	Turdus iliacus. Lin.	Black bird	—	Lon dubh
	Turdus merula. Lin.	Ring ouzel	—	Dubh-chraige
	Turdus torquatus. Lin.	Water ouzel	Water crow	Gobha-uighe
	Sturnus cinclus. Lin.	Chatterer	—	—
	* Ampelis garrulus. Lin.	Bullfinch	—	Corcan coille
	Loxia pyrrhula. Lin.	Greenfinch	—	Glaifean darach
	Loxia chloris. Lin.	Common bunting	Buntling	Gealaq-bhuachair
	Emberiza miliaria. Lin.	Yellow hammer	Yellow yeldring	Buidheag bhealaidh
	Emberiza citrinella. Lin.	Reed sparrow	—	—
	Emberiza caesia. Lin.	Snow bunting	Snow flock	Eun an t-sneachdaish
	Fringilla carduelis. Lin.	Goldfinch	Gold spink	—
	Fringilla caelebs. Lin.	Chaffinch	Green lintwhite	Bricean beatha
	Fringilla montifringilla. Lin.	Brambling	—	—

Figure 11: An extract from Stuart's list of land birds.

The Latin names in the left hand column of the table are given in binomial form generally using the Linnean classification. The asterisk indicates a species Stuart believed to be migratory. Rose has noted that the Linnean system of classification was adopted more quickly for the study of botany rather than zoology in Britain.⁹⁴ The evidence from Stuart's account is that, by the 1790's when the account was written, he had adopted the Linnaean system for the great majority of animal species he identified in the parish. For a small number of species, Stuart refers in abbreviated form to authorities other than Linnaeus. From the abbreviations it is possible to identify the authorities listed. These are given with brief biographical details in the table below.

⁹⁴ Edwin Rose, *Reading the World: British Practices of Natural History, 1760-1820* (Pittsburgh, 2025), pp. 20-25.

Table 38: Authorities cited by Stuart

Reference	Species	Source
Brisson	<i>Colymbus minor</i> (dusky grebe)	Mathurin Jacques Brisson (1723-1806), French zoologist and natural philosopher. Published six volumes of <i>Ornithologie</i> in 1760. ⁹⁵
Brunnich	<i>Mergus stellatus</i> (speckled diver)	Morten Thrane Brunnich (1737-1827), Danish zoologist and mineralogist, published <i>Ornithologia Borealis</i> (1764). ⁹⁶
Forst.	<i>Lepus hieme albus</i> (alpine, or white hare)	Johann Reinhold Forster (1729-1798), German pastor and naturalist. Accompanied and published an account of James Cook's second Pacific voyage (1772-1775). ⁹⁷
Gesner	<i>Turdus pilaris</i> (fieldfare) <i>Linaria</i> (linnet) <i>Parus major</i> (great titmouse) <i>Parus caeruleus</i> (blue titmouse)	Conrad Gesner or Gessner (1516-1565), Swiss physician, naturalist, bibliographer, and philologist. His <i>Historia Animalium</i> was published in five volumes, lavishly illustrated, between 1551-1558. ⁹⁸
Klein	<i>Catus sylvestris</i> (wild cat) <i>Mustela vulgaris</i> (common weasel)	Jacob Theodor Klein (1685-1759), from Gdansk, historian, botanist, zoologist, and mathematician. ⁹⁹
Plinii.	<i>Lagopus altera</i> (grouse) also references 'Raii.' and 'Syn.'	Pliny the Elder (AD 23/24-AD 79) Author of <i>Naturalis Historia</i> , 37 books covering an encyclopaedic range of subjects. 'The Natural History is a key document in the history of science and scholarship in Europe.' ¹⁰⁰
Raii.	<i>Martes abietum</i> (pine marten) <i>Pygargus accipiter</i> (ringtail) <i>Lampetra</i> (lamprey) <i>Salmulus</i> (samlet or parr)	John Ray (1627-1705), an early 'parson naturalist' edited and published Willughby's <i>Ornithology</i> (1676) and (posthumously) <i>Synopsis Methodica Avium & Piscium</i> (1713) ¹⁰¹
Syn.		Perhaps Thomas Pennant's <i>Synopsis of quadrupeds</i> (1771) or Ray's <i>Synopsis</i> ? ¹⁰²

⁹⁵ Mathurin Jacques Brisson, *Ornithologie, ou, Méthode contenant la division des oiseaux en ordres, sections, genres, especes & leurs variétés* (Paris, 1760).

⁹⁶ Morton Thrane Brunnichii, *Ornithologia borealis, sistens collectionem avium* (Copenhagen, 1764).

⁹⁷ Johann Reinhold Forster, *Observations Made During a Voyage Round the World* (London, 1778).

⁹⁸ Conrad Gessner, *Historia Animalium* (Zurich, 1551-1558).

⁹⁹ Andrzej Januszajtis, 'Scientists in Old Gdansk: 17th and 18th Centuries', *Task Quarterly*, vol. 5 (2001), pp. 389-399.

¹⁰⁰ Aude Doody, 'Pliny the Elder' in *Oxford Bibliographies* <https://www.oxfordbibliographies.com/>.

¹⁰¹ Francis Willughby and John Ray, *The Ornithology of Francis Willughby of Middleton in the County of Warwick* (London, 1678); John Ray, *Synopsis methodica avium & piscium: opus posthumum* (London, 1713).

¹⁰² Thomas Pennant, *Synopsis of Quadrupeds* (Monk, 1771).

The range of sources includes some leading European naturalists indicating that, in addition to his field work, Stuart was widely read in natural history.

Stuart's accomplishments are impressive. He could read English, Gaelic and, from the evidence above, French and Latin, suggesting that he was an accomplished scholar. He was also a skilled fieldworker, identifying and classifying mountain flowers and preparing, from observation, the list of species of 'wild animals' in the parish of Luss. In addition, we know from Pennant that he was a traveller and correspondent, and his observations on oak woods suggest he was a keen observer of the local rural economy. He is listed in its Transactions as a founder member of the Royal Society of Edinburgh.¹⁰³ He was, in short, an outstanding example of an enlightenment minister who had a deep understanding of the natural world.

David Ure of East Kilbride (1749-1798): the Father of Scottish Palaeontology

David Ure was born in Glasgow, the son of a weaver, whom he followed into the trade. Alongside his work, he attended lectures at Glasgow University from 1770, where he was a pupil of John Anderson, graduating with an M.A. in 1776.¹⁰⁴ After studying theology he was appointed assistant minister in East Kilbride in 1783. In that post he explored the fossils exposed in quarries in the parish. He was disappointed not to be appointed minister upon the death of David Connell in 1790 but had attracted the patronage of John Sinclair for whom he wrote three parish accounts: East Kilbride, Rutherglen and Killearn (Stirling).¹⁰⁵ The accounts of East Kilbride and Rutherglen are relatively short but include descriptions of minerals, particularly coal and iron stone, and a brief summary of the fossils. The account of Killearn contains detailed descriptions of rare plants using Linnaean terminology, native and plantation trees and a detailed description of minerals. For Sinclair he also prepared three volumes of county agricultural surveys (Roxburgh, Dumbarton and Kinross). In 1796 he was appointed minister at Uphall, but survived only two years, dying in post in 1798.

¹⁰³ List of Members in *Transactions of the RSE*, vol. 1 (1788), pp. 89-93.

¹⁰⁴ An account of the life and work of David Ure is James H. Burns, 'From Enquiry to Improvement: David Ure (1749-1798)', *Scottish Historical Review*, vol. 87 (2008) pp. 258-277.

¹⁰⁵ Rutherglen, County of Lanark, OSA, Vol. IX, 1793, pp. 1-11; East Kilbride, County of Lanark, OSA, Vol. III, 1792, pp. 421-429; Killearn, County of Stirling, OSA, Vol. XVI, 1795, pp. 100-129.

Ure's account of East Kilbride refers to his *History of Ruther Glen and East Kilbride*, a substantial work covering the political, social and natural history of the two parishes.¹⁰⁶ This publication explores the natural history of the two parishes in much greater detail than his OSA accounts. In recognition of this groundbreaking work, he later came to be known as the 'father of Scottish palaeontology'.¹⁰⁷ The volume was organised into six chapters, summarised in the table below.

Table 39: Contents of *The History of Ruther Glen and East Kilbride*

Chapter	Contents	Pages
I	Of the Borough of Rutherglen, its Charters, Set Antiquities, commissioners and Provosts Names	1-106
II	Of the Parish of Rutherglen, its Extent, Agriculture, Antiquities, Trade, Proper Names	107-138
III	Of the Parish of East-Kilbride, its Extent, Population, Places of Note, Proper Names	141-179
IV	Of Agriculture, Trade, Diseases, Poor, State of Religion, Church, Sepulchral Monuments	180 -227
V	Of the Natural History of Rutherglen and Kilbride, containing an Account of Indigenous Animals, Plants and Fossils	229-294
VI	Of Extraneous Fossils, containing and Account of Vegetable Impressions, Petrified Wood, Shells, Entrochi, Coraloides and Fishes Teeth	295-334
	Plates	
	List of Subscribers	

Subscribers to *The History*

A useful source information is the list of subscribers included in the *History*. It gives the names of over 700 subscribers who purchased over 900 copies of the *History*. James Burns has examined the professional backgrounds of subscribers, where these have been listed, as summarised in table 40.¹⁰⁸

¹⁰⁶ East Kilbride, County of Lanark, OSA, Vol. III, 1792, p. 429.

¹⁰⁷ David Ure, *The History of Ruther Glen and East Kilbride, published with a View to Promote the Study of Antiquity and Natural History* (Glasgow, 1793). The Scottish Geology Trust website refers to him as 'the father of Scottish palaeontology'; see www.scottishgeologytrust.org/geology/scotlands-geology/famous-scottish-geologists/david-ure/. The description was also used by Michael Keen, 'David Ure and the first illustrations of British fossil Ostracoda', *Journal of Micropalaeontology*, vol. 12 (1993), p. 8, but the term may be of older origin.

¹⁰⁸ Burns, 'From Enquiry to Improvement', p. 265-266.

Table 40: Subscribers to Ure's *History*

Occupation	Number of subscribers
Minister and preachers	94
Merchants	54
Manufacturers and tradesmen	44
Lawyers	21
Academics	29 (including 13 professors, 10 schoolmasters 6 students)

The number of professors subscribing suggests Ure had established a good reputation among academics. They were from a wide range of academic backgrounds including Joseph Black, Professor of Chemistry in Edinburgh; James Hutton; John Millar, Professor of Law in Glasgow; Alexander Munro, Professor of Anatomy in Edinburgh'; John Playfair, Professor of Mathematics in Edinburgh; John Robison, Professor of Natural History in Edinburgh (5 copies); Dugald Stewart, Professor of Moral Philosophy in Edinburgh; and John Walker, Professor of Natural History in Edinburgh'.

The large number of clergy subscribing is striking. It includes some ministers who were authors of parish accounts and who have appeared elsewhere in this study. The list includes William Bennet of Duddingston, Robert Boag (or Boog) of Paisley, William Boyd of Fenwick, Thomas Brisbane of Dunlop, James Lapslie of Campsie, Thomas McCourty of Penicuik, Michael McCulloch of Bothwell, James Meek of Cambuslang, Robert Rennie of Kilsyth and James Wodrow, of Stevenston. The list of subscribers points to widespread interest in Ure's work, across Scotland and across occupational backgrounds, including academics, ministers, merchants, manufacturers and others.

Contents of the *History*

David Ure set out his intentions in the preface: 'The history of nature, equally with that of antiquity, lends her assistance to the useful arts. The better we are acquainted with the objects of natural history, the more able we shall be to apply these objects, with success, to the various pursuits of life.'¹⁰⁹ He shared the scepticism of others about theoretical explanation: 'I have not indulged myself in making theories; and have seldom referred to theories already made.'¹¹⁰ He also noted that he had prepared the

¹⁰⁹ Ure, *History of Ruther Glen and East Kilbride*, p. iii.

¹¹⁰ Ure, *History*, p. vi.

history in 1789, before the statistical accounts, although the preface (dated 2 January 1793) suggests he may not have completed the work by that date.

In chapter four, he mentioned agriculture, lamenting the slow progress of improvement. He explained that because the soil of the parishes was ‘cold and sour’ it needed drainage. Drainage had been put into effect on the Kittochside estate only, and Ure complained that: ‘Prejudices in favours of old customs obstinately oppose improvements in agriculture.’¹¹¹. He was also scathing about parishioners who refused to inoculate their children against smallpox, of which there had been a lethal outbreak in 1787. Many children were taken ill in the parish, of whom only thirteen survived:

Rooted prejudices, founded upon arguments, some of which are trifling, others absurd, have such a strong influence on the minds of the people, that they sit still, in sullen contentment, and see their children cut off in multitudes.¹¹²

Chapter V described the mammals and birds of the parishes, including microscopic freshwater polyps (hydra) and different species of leech. Referring to Linnaeus, Leeuwenhoek and Tremblay, Ure included his own observations on the life cycle of leeches. The section on flora includes a list of ten pages of the names of scarce indigenous plants (figure 12). This included the name in Latin using the Linnean system, any popular names, and the location where the species were found. Such a list alone would secure Ure’s reputation as a minister naturalist, if it were not overshadowed by his study of fossils.

¹¹¹ Ure, *History*, p. 184.

¹¹² Ure, *History*, p. 205.

240 THE NATURAL HISTORY OF		
A L I S T		
OF		
SCARCE INDIGENOUS PLANTS,		
IN		
RUTHERGLEN AND KILBRIDE.		
Adoxa	<i>moschatellina</i>	Tuberous Moschatel. <i>Banks of Calder.</i>
Æthusa	<i>meum</i>	Bawd-money. <i>Kittochside, Croft-hill in Kilbride.</i>
Agrimonia	<i>eupatoria</i>	Agrimony. <i>Croftbaket, Farme.</i>
Aira	<i>caryophylla</i>	Silver Hair Grass. <i>Scotstoun.</i>
A.	<i>coespitosa</i>	Turfy do. <i>Whitemoat.</i>
A.	<i>flexuosa</i>	Mountain do. <i>Maxwelltown.</i>
Allium	<i>urfinum</i>	Ramsons, or Wild Garlic.* <i>Mauchlanbole.</i>
Anemone	<i>nemorosa</i>	Wood Anemone. <i>Banks of Clyde and Calder.</i>
Anthericum	<i>officinarum</i>	St. Asphodel. <i>Peat-moat, K.</i>
Anthyllis	<i>vulneraria</i>	Kidney Vetch. <i>Quarry near Philipshill, and pastures between Kittochside & Carmunnock moor.</i>
Arenaria	<i>rubra</i>	Purple-flower'd Chickweed. <i>Stonelaw.</i>
		Arum
* Cows eat this plant so plentifully, in the beginning of Summer, that the milk partakes of the taste and smell of garlic.		

Figure 12: Extract from a list of scarce indigenous plants

The Fossils of East Kilbride and Rutherglen

Ure's enthusiasm for the fossils of his parishes (and his limited travels) is apparent in his claim that: 'The parishes of Rutherglen and Kilbride contain a greater variety, in both classes, than, perhaps, any other bounds of equal extent in the world.'¹¹³ He divided fossils into two classes 'native' and 'adventitious'. By 'native' Ure meant minerals including clay, limestone and coal and 'adventitious' the petrified remains of animals and vegetables. Under 'native' fossils he discussed theories on the origin of coal, considered the arguments that it might be of vegetable origin but remained cautious: 'Here an opportunity is afforded of investigating the theories that have been given of the origin of coal. But more facts are, perhaps, yet necessary to enable any person to form a true theory, concerning this part of the mineral kingdom.'¹¹⁴ This task was later undertaken by his fellow minister, Robert Rennie, as described above.

¹¹³ Ure, *History*, p. 295.

¹¹⁴ Ure, *History*, p. 274.

He concluded the account of minerals with a description of the strata underlying the parishes to a depth of 200 feet, including five tables showing the results of test explorations for coal.¹¹⁵

Plant Fossils

While his claims for the unique richness of fossil in the parishes are exaggerated, the range of fossils that Ure described and drew in the parishes is remarkable. Chapter VI of the *History* is, arguably, one of the most important pieces of writing on natural history by a Church of Scotland minister in the eighteenth century. Ure divided the fossils of animals and plants into terrestrial and marine. Beginning with terrestrial fossils he noted that the great majority were of plants, including leaves, branches or other vegetable remains, many thousands of which he discovered in the strata lying immediately above coal measures. From these observations he was able to deduce information about the environment in which the fossils had been deposited:

They are thrown together in the utmost disorder; only they lie flat, in a horizontal direction. From several circumstances it appears, that they did not grow where now found; but were carried by water from their native soil, and deposited among sand or mud, now converted into stone or till.¹¹⁶

His observation on the disorderly arrangement of their deposition led him to conclude that the fossil vegetation must have had been displaced by water and deposited in soft sediments, subsequently consolidated into sedimentary rock. He went on to add further details:

Such a vast quantity of mud, containing many millions of vegetables, must have been collected in a deep and large bay, where the smallest particle of argilla, or mica, had sufficient time to subside. The depth of water, in which they were suspended, must have been very great.¹¹⁷

This adds important detail. From careful observation Ure was able to suggest a dynamic past environment in which vegetation was being transported by water and then deposited in a deep bay. Most of the specimens he collected, described and drew were fragmentary and the largest proportion were cryptograms (ferns) of which he could identify only a portion: ‘Some of the species are not now natives of Europe: and others have never, anywhere in the world, been discovered in a recent state.’

¹¹⁵ Ure, *History*, tables on pp. 286-293.

¹¹⁶ Ure, *History*, p. 296.

¹¹⁷ Ure, *History*, p. 296.

Figure 13 is an example of a plate drawn by Ure and his attempt to identify different species.

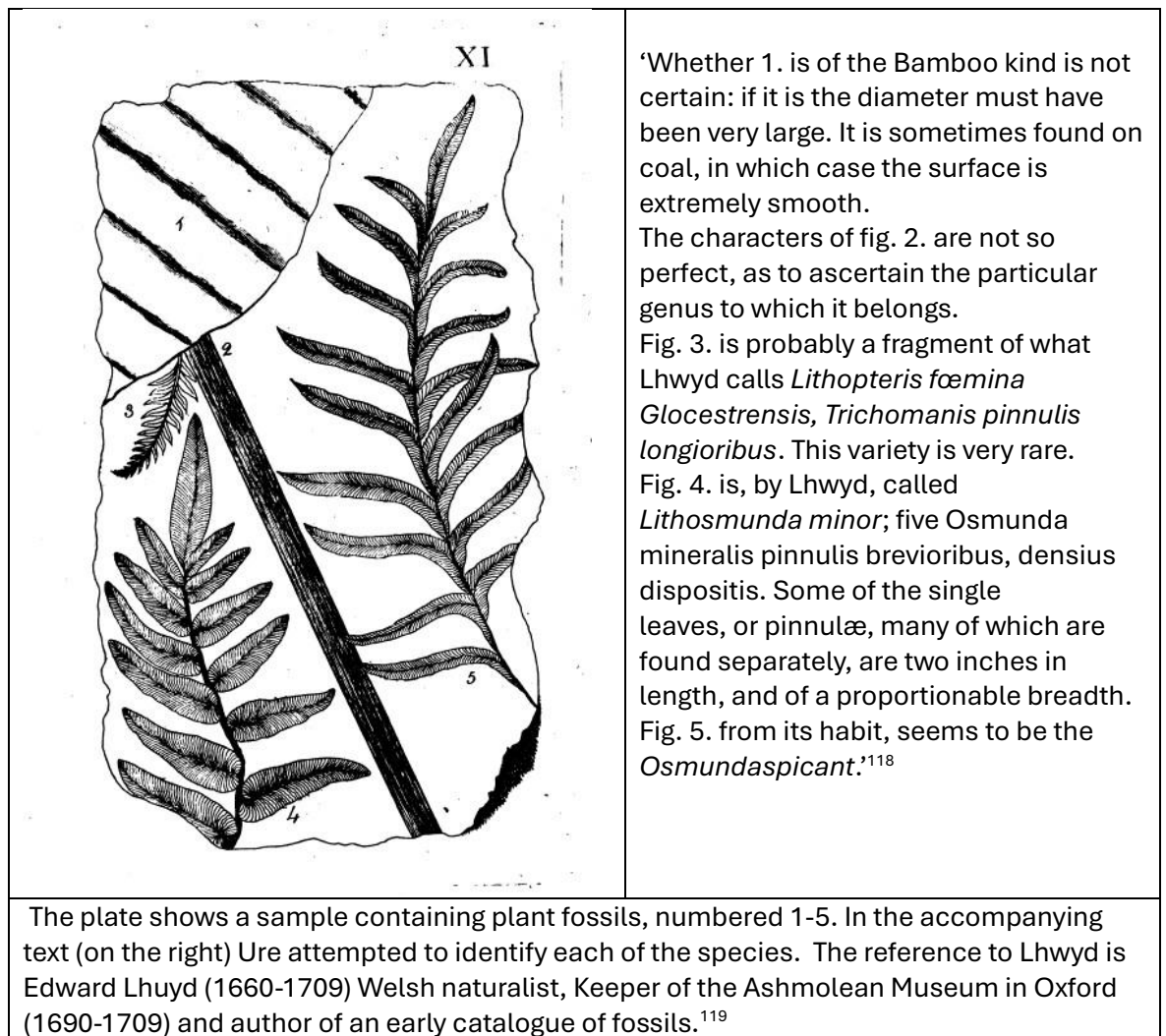


Figure 13: Plate XI in Ure’s History

Ure identified all the species in these plates as terrestrial in origin, with no marine species, indicating that they were deposited in freshwater sediments. Ure also indicated that some of the species he found were yet unknown. He did not speculate on why this might be but others who were studying fossils were finding similar unknown species, including Cuvier and Lamarck in Paris, both of whom went on to explore what the fossil record suggested about life on earth in former ages. Ure was prepared to discuss earth history but did so with ‘great caution’:

¹¹⁸ Ure, *History*, p. 298.

¹¹⁹ See T. Jones, ‘Lhuyd, Edward (1660-1709), botanist, geologist, antiquary, and philologist’, *Dictionary of Welsh Biography*, <https://biography.wales/article/s-LHUY-EDW-1660>. Ure referred to Lhwyd’s catalogue of fossils, *Lithophylacii Britannici Ichnographia* (Oxford, 1699).

In our enquiries into such subjects, great allowances must be made for the different states of the earth, at different periods. We cannot, perhaps, form an adequate idea of the state of the upper strata of the earth, soon after it emerged out of the chaotic waters, or the universal deluge. A local inundation might, for ought we know, have then produced effects, of which the recent phenomena of the world can give us no examples. We should, therefore, proceed with great caution, in drawing comparisons between the ancient and present state of the globe: and the theories we presume to make of the formation of the earth, and many of its pristine phenomena, should be proposed with the utmost diffidence.¹²⁰

This passage suggests he accepted the standard diluvial theory of earth history described above in chapter two.

Marine Fossils

The concluding section of the *History* describes marine fossils as: 'the petrified productions of the sea' which, Ure noted, far outnumbered the fossils of plants.¹²¹ They included shells of univalve and bivalve molluscs which he described and drew. Among these were examples of orthoceratites (simple conical shells), cockles and mussels. He noted that: 'the marble in Rutherglen abounds with a vast quantity of the Muscle and large numbers of entochi'.¹²² He also noted the abundant remains of coral in limestone: 'Sometimes a mass of them containing many thousands, or rather millions, is found in some quarries'.¹²³ As with fossils of flora, he reflected on the significance of marine fossils for our understanding of earth history.

These remains of the ancient ocean become highly interesting, when we consider them as furnishing us with an undeniable proof, that the earth, in some remote period, underwent a very great change.¹²⁴

Ure accepted that the earth was of a great age and was not the product of a recent creation event. He also dismissed the idea that the fossils were deposited by a great storm but argued that, unlike the remains of plants, they died where they had lived. 'It is evident, on the slightest attention, that these bodies possessed organisation and life, in the same manner that shellfish and other marine productions do at present. It is almost certain, that most of them lived and died in the places where now found.'¹²⁵

¹²⁰ Ure, *History*, p. 298.

¹²¹ Ure, *History*, p. 305.

¹²² Ure, *History*, p. 311.

¹²³ Ure, *History*, p. 327.

¹²⁴ Ure, *History*, p. 332.

¹²⁵ Ure, *History*, p. 333.

Ure was not drawn into explaining how marine fossils came to be found at inland sites well above sea level and again repeated his reservations about theoretical speculation:

From this view of them some plausible theories of the earth have been formed; and a multiplicity of arguments drawn to illustrate the causes by which the great revolutions of the earth were brought about. Facts, however, are daily occurring which stand in opposition to most of these theories, and prove them to have been too hastily made. The more enquiries, unbiased by theories, we make, and the greater number of facts that are undisguisedly related, the more able, surely, will mankind be to discover the phenomena by which the globe of the earth was thrown into its present state.¹²⁶

Ure shared the scepticism of theory common to empirical natural historians like John Walker. He was aware that there have been great ‘revolutions’ in the earth’s history and that new evidence was coming to light ‘daily’ that was revising our understanding. His categorical dismissal of theory sits a little uncomfortably with the reasoning he demonstrated in reconstructing past environments, and he called for more empirical study which he believed would provide evidence consistent with Mosaic earth history.

I can say for my own part, that the more attentively I enquire into this subject, and the greater number of theories I consult, the more clearly I perceive the truth of the sacred theory given by Moses.¹²⁷

It is not entirely clear which part of the Mosaic account of creation he is referring to, given the evidence he presented on the antiquity of the earth and its fossil record. Presumably it is the evidence for the flood but there is no further detail in the account to guide us. Towards the end of the *History* Ure concluded with a statement on the importance of studying of the natural environment.

The serious contemplation of these natural objects affords a great source of pleasure to an inquisitive mind. They exhibit, in clear characters, the wisdom and goodness of the Deity. They lead back our ideas to the most remote ages of time, when these, now petrified, substances answered, by their various functions, some important purpose in the scale of animated existence. It must afford rational pleasure to reflect upon the means by which these exuviae have, for thousands of years, been preserved, without being totally destroyed: how some fragments as thin as paper, and equally fine with the hairs of our head, still retain their original shape and most minute configurations. A mind led into a train of thinking upon

¹²⁶ Ure, *History*, p. 333.

¹²⁷ Ure, *History*, p. 333.

these curious parts of the natural kingdom of God, must enjoy more solid satisfaction, than can be procured from some of the more noisy pursuits in life.¹²⁸

For Ure, as for Thomas Reid, John Anderson and others, the study of nature was both rational and pleasant and could bring the observer into a closer relationship with God, and better understanding of God's purposes. The study of nature was both useful and sacred in purpose.

These objects, although heedlessly trodden under foot by the rustic and unthinking clown, are far from being useless in medicine, and some of the sciences: they open to the lovers of Natural History an extensive field for the most rational contemplation; and they raise the mind to grand and elevated conceptions of the Great Creator and Preserver of all things.¹²⁹

With Rennie, Ure's conclusions could be read as a manifesto for the minister naturalists of the Scottish enlightenment. Ure had been identified by John Anderson as a potential professor of natural history at his new institution in Glasgow but neither Ure nor Anderson lived long enough to make the ambition a reality. As a professor Ure would have made a fitting partner in Glasgow to Jameson in Edinburgh. Both were committed to empirical study of the natural environment, and while sceptical of theory were willing to follow the evidence from fossil and other sources. As noted above there is evidence that Jameson towards the end of his life began to accept the Huttonian theory of the earth: we can only speculate whether Ure might have done the same.

Conclusion to Chapter Eight

The evidence from these six examples and the associated appendix suggests a number of conclusions. The examples presented in this chapter demonstrate a remarkable level of expertise on a range of environmental subjects, often sustained through study over many years. The long list of ministers in the appendix also points to the level of interest and expertise among many more ministers, a list that would be considerably longer if time and space allowed for further study.

In most cases, interest in the natural environment was linked to a commitment to improvement: ministers were committed to practical enlightenment. Rennie's work on peat reflected his interest in the natural history of peatlands for their own sake and

¹²⁸ Ure, *History*, p. 333-334.

¹²⁹ Ure, *History*, p. 334.

for its utility, to better understand their quality and uses, particularly for agriculture. Meek's painstaking observations of temperature, pressure and rainfall were undertaken in part to provide useful information for agricultural improvement. Ministers in coalfield parishes who wrote knowledgeably about the stratigraphy of coal measures supported the development of the coal industry and its associated technology of steam engines. There appeared to be no contradiction for ministers between an interest in the natural world and enthusiasm for its exploitation by industry and agriculture. A small number of ministers were aware of pollution from agriculture or industry, but they were relatively few. Among those ministers listed in the appendix only one, David Dow of Cathcart, mentioned the need for conservation. The great majority were enthusiastic advocates of improvement.

The minister naturalists were committed to empirical science but less enthusiastic about theories of the earth's history: Bennet, Graham and Ure all expressed the same, almost formulaic, criticism of speculative theories. As noted in chapter three this can be explained in part by ministers' education in the empirical methodology of natural history in Scottish universities amplified by 'theophobia' associated with the revolution in France. Rennie, writing in the first decade of the nineteenth century was more ambiguous, criticising theory but setting out a hypothesis of his own suggesting the origin of fossil fuels. It is apparent that ministers were not critical of scientific study of nature even when it offered new and challenging evidence about the history of the earth.

Chapter Nine: Conclusion

This conclusion summarises the main outcomes of this study. It begins by noting the value of the OSA as a source. It goes on to discuss the questions raised in the introduction about ministers' interest and attitudes towards the natural environment: why did Church of Scotland ministers write such detailed accounts of the natural world; what do the accounts tell us about their attitudes towards the natural world and what influenced their interests and attitudes? Finally, it returns to the starting point of the thesis and the insights gained into ministers' attitudes towards James Hutton's *Theory of the Earth*. It also identifies suggestions for further work arising from the study.

The OSA as a Source

While the parish accounts have been used extensively as a source of information on late eighteenth century Scotland, this is the first study that has used the OSA to explore, systematically, ministers' attitudes towards the environment. The study has demonstrated that the OSA provides an unparalleled source of information, both about ministers' interest in the natural environment and their attitudes towards it. When linked to other sources, including the Fasti and any publications or surviving manuscripts by ministers it forms an excellent source of information about ministers' knowledge of the natural environment. The only significant gaps in coverage are for the cities of Aberdeen, Edinburgh and Glasgow, for which the authorship of the accounts is uncertain; otherwise, the insights given by the OSA into ministers' views is comprehensive and detailed.

Ministers and the Environment

The study has shown that many ministers had a remarkable level of interest in the natural world. Almost all aspects of the natural environment, including flora, fauna and the physical environment, attracted their interest. Chapters five and six summarised this material by theme, drawing on examples from all parts of Scotland. These examples revealed that a significant proportion of ministers were particularly knowledgeable and could be described as 'minister naturalists'. The OSA provides ample evidence of ministers' knowledge of different aspects of the natural world, for

example of their interest in native woodlands and new plantations, of fish, wild animals and migratory birds. Many of these accounts revealed that minister naturalists were aware of contemporary developments in natural history, for example in their use of the Linnean system for describing species or bird migration. The accounts cover almost all aspects the physical environment, including climate and weather, peatlands, minerals, fossils and landforms. Only the impact of glaciation on Scotland's landscape eluded them, as it did other natural historians in Scotland before the 1840s. Soils and their management were critical to agricultural improvement and were described in detail in most accounts.

This study has also demonstrated that ministers' attitudes towards the natural world were shaped and influenced both by their education and the by the ideology of improvement. Ministers were educated in Scottish universities where they were taught that the study of nature was consistent with reformed theology. Natural theology, natural history and natural philosophy were closely associated with each other in the education of prospective ministers following the arts curriculum in Scottish universities. This helped shape the future ministers' interest in the natural world, with the empirical methodologies of natural history, including identification, description and classification, being in evidence in many of the parish accounts in the OSA. However, ministers were also grounded in the daily life of their parishes, responding to the natural environment around them, working with the kirk session, with heritors, and with other members of the community, whether rich or poor. Their accounts show detailed knowledge of environmental management, including farming and industries, and real understanding of the challenges faced by many of their parishioners in making a living. The many references to the hardships ensured by parishioners after the harvest failure of 1782 are testament to this lived experience.

In this context of their education, theology and experience, the accounts repeatedly, and almost universally, promote the ideology of improvement. Improvement was celebrated where it had occurred, encouraged where it was in progress and lamented where it was absent. Improvement was most usually associated with agriculture but there are examples in the accounts where it was also related to health and housing. Ministers believed that improvement could deliver benefits for all, increasing the incomes of landowners and tenant farmers and improving the housing, diet and

health of rural populations. They did not mourn the loss of biodiversity associated with agricultural change but rather endorsed with enthusiasm the elimination of ‘pest’ species. In the manufacturing towns and cities most ministers were supportive of the development of new industries, particularly coal mining, and only rarely mentioned or complained about the pollution associated with such industries. Some ministers also believed that improvement could make the landscape more beautiful. This can be illustrated with reference to a painting of a slightly later date (1816) by John Knox.



Figure 14 View of the Clyde from Faifley and Duntocher, by John Knox, c.1816¹

This painting reflects the contents of the accounts in a few ways. It is a detailed illustration of a landscape ‘improved’ by human activity and shown in a picturesque light. It depicts the river Clyde downstream from Glasgow, looking west towards Dumbarton Rock, which can be seen to the right of the painting. Knox painted the hills of Renfrewshire in the background, beyond the Clyde, and the rolling landscape of Dunbartonshire in the foreground. There are fields with cattle, and some farm buildings in the lower middle ground. By the lochan on the right stands an elegant villa and above the villa, an industrial building. The design of the structure and the date of the painting suggest that this was a cotton spinning mill, complete with

¹ The image is reproduced from the website of the Fleming-Wyfold Art Foundation, where it may be examined in more detail: <https://www.flemingcollection.com/>.

workers cottages. There are several sailing ships on the river (at least a dozen) suggesting the vibrant commercial trade plying the Clyde up and down to Glasgow. Just visible on the extreme left is a small steam ship, a symbol of the coming transformation of transport by steam power. It is a well wooded scene with a clump of trees placed for scenic effect, dominating the painting. There are only two small figures, both women, to the left of the trees.

In the painting, Knox suggested a scene of harmony and prosperity where industry and agriculture could coexist happily in a picturesque landscape. There is no evidence in the painting of poverty, disorder or pollution, save for a small amount of smoke rising from the steamship and the cottages. Both the gentleman's house and the mill buildings appear to be bright and clean. The picture was painted twenty years after the OSA were written, when the romantic style had become more firmly established but it remains an idealised landscape which reflects the aspirations of many ministers' accounts for improvement, harmony, prosperity and order. Knox has bathed the landscape in a golden glow, the light of the setting sun, casting shadows to the east. It is tempting to see this setting sun as the end of the era of improvement. The growth of industry, and of towns and cities, would reshape the economy, creating a new urban environment and a new social order, disturbing the enlightenment vision of the eighteenth century. The painting presents a fitting conclusion to the study, highlighting the aspirations set out by many ministers in the OSA.

While some ministers described the landscape in terms of the picturesque, sublime or romantic this did not mean that they had adopted later romantic ideas about the conservation of nature. David Dow at Cathcart was unusual, possibly unique, in calling for conservation of woodland species in his parish.

Ministers and the *Theory of the Earth*

This study opened with a discussion of the response of the Church of Scotland and its ministers to James Hutton's *Theory of the Earth*. Close reading of the OSA revealed no evidence of any shock or horror on the part of ministers to the *Theory*. No minister suggested that the earth was only 6,000 years old, and none claimed that Genesis provided the literal truth about the earth's origins. Educated in natural philosophy and natural history, Church of Scotland ministers were too well informed about the

natural world, and too committed to enlightenment values, to respond in such simple terms, and they were certainly not ‘creationists’.

Rather, ministers reacted with interest and excitement to a range of new ideas about the physical environment. Many ministers described the rocks and minerals of their parish, and some discussed the origins of landforms. Many noted the existence of fossils, and some noted that the remains of marine or tropical creatures were being unearthed at inland locations. One minister, David Ure, imaginatively suggested the past environment in which such fossils had been laid down. Some ministers mentioned the former ‘revolutions’ of the earth and others debated whether rocks were sedimentary or volcanic in origin. All these examples point to a sophisticated understanding of contemporary developments in natural history and geology.

Of the few ministers who did respond to Hutton, the most enthusiastic was John Playfair, minister and professor at Edinburgh University, who had accompanied Hutton on his excursion to Siccar point in 1788. The most sceptical response noted in the accounts was Patrick Graham in Aberfoyle who, echoing Deluc, questioned how burns and rivers could have the energy to transport detritus from the hills to the sea, when in his parish the rivers could not fill the freshwater lochs of the parish. His scepticism would later be justified when it became apparent that ice rather than water was an important agent of landscape formation in the Scottish highlands. Among minister naturalists there was a general scepticism about the use of theory and a preference for empirical observation, a trend that was shared by many others studying the natural environment. This dislike of theory may reflect concerns about the revolution in France but even in France, Georges Cuvier, arguably the most important earth scientist at the end of the eighteenth century, expressed the same disdain for theory. The lack of evidence means we cannot be certain what ministers thought about Hutton’s *Theory*, but the context in which they lived, the influence of the Scottish Enlightenment, their education, and their attachment to improvement all point to a respect for empirical science, and an interest-albeit sceptical-in theory. Any attempt to portray Church of Scotland ministers as part of a religious resistance to geology is not supported by the evidence of the OSA. As Thomas Pennant had reported earlier in the century, in his account of a tour of Scotland in 1769: ‘Science

almost universally flourishes among them'.² These were the ministers who were content to receive Hutton's *Theory* with equanimity.

This study ends in 1800, but it suggests number of questions which a study of the New Statistical Account might help illuminate. There were several rapid developments in the new century that may have affected minister attitudes towards the natural environment. These included the transformation of natural history and natural philosophy into new sciences, including geology, meteorology and palaeontology. The study of fossils and their relationship to different strata offered increasing amounts of information on the earth's history, as did the recognition of the importance of ice in shaping the landscape of Scotland. The debate on the past extinction or transmutation of species became of great importance, leading to theories of evolution by mid century. Alongside such scientific developments there were economic and theological changes in Scotland. The rapid growth of towns, cities and manufacturing industries led to increasing exploitation of mineral resources, transforming landscapes and creating inescapable problems of pollution. The spread of extensive sheep farming across the highlands and islands, mentioned by some ministers in the OSA, accelerated greatly in the new century, with destructive implications for highland communities and for biodiversity. There were also changes in churches, with the growth of natural theology and evangelism. The moderate leadership of the Church of Scotland was challenged by an evangelical revival leading, eventually, to the Disruption of 1843. It is likely that the NSA could illuminate many of these issues and the extent to which they reshaped ministers' attitudes towards science and the environment. For example, how did ministers react to the growing problems of pollution in towns and cities and the increasing contamination of air, water and land? Is there any evidence of growing interest in nature conservation, so strikingly absent in the OSA? A study of the NSA could throw light on these and other questions.

² Thomas Pennant, *A Tour in Scotland 1769* (Edinburgh, 2000), p 143.

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Appendix One: Minister Naturalists in the OSA

This table lists a sample of ministers who wrote accounts of particular interest, the parish they were describing and their university degree, if known. See chapter eight for more details.

Minister	Parish	Education	Principal items described in the accounts and other sources
George Baird (1761-1840)	Dunkeld, Perth (1787-1792), Moderator General Assembly (1800)	M.A. (1787) Edinburgh.	Plantations, with details of trees planted, their dimensions and rates of growth; native oakwoods and how their management might be improved; wild animals of the parish including red deer and reindeer (introduced by Duke of Atholl); aquatic life of River Tay and Loch Ordie. Includes a detailed description of agricultural improvement with advice for farmers.
George Barry (1748-1805)	Kirkwall, Orkney (1782-1793), Shapinsay (1793- 1805)	M.A. Edinburgh;	Seabirds, with Orcadian names for species; resident and migratory landbirds; sea fish and the opportunities for a fishing industry. Author of <i>The History of the Orkney Islands</i> , describing the natural history of the islands. ¹ Includes mineralogy, botany (with list of plants indigenous to the islands); the lack of woodland; zoology including descriptions of freshwater fish, sea fish and shellfish, terrestrial mammals, reptiles, and birds.
William Bennet (1763-1805)	Duddingston, Edinburgh (1786- 1805)	?	Picturesque description of the parish, brief history of use of Edinburgh's waste as manure, carboniferous geology and coal mines; natural history of the parish including minerals, fossils, botany, seafish and shellfish; lists species of aquatic flora of Duddingston loch.
Robert Boog (1746-1823)	Paisley Abbey, Renfrew, (1774- 1823)	Edinburgh	River Cart, effect on fish of industrial pollution; the absence of woods; carboniferous geology including coal, free stone and limestone; and fossils including 'figured stones'.
John Burgess (1725-1795)	Kirkmichael, Dumfries (1759- 1795)	M.A, Glasgow (1747)	Flora and fauna including woodland trees, rare species of flower; main animals and birds with dates migratory birds appear. Correspondent of

¹ George Barry, *The History of the Orkney Islands* (Edinburgh, 1805).

Minister	Parish	Education	Principal items described in the accounts and other sources
			Linnaeus and Pennant; contributed to John Lightfoot's <i>Flora Scotica</i> . The fungus <i>Leptogium burgessii</i> is named in his honour. ²
David Dow (1757-1827)	Cathcart, Renfrew (1785-1827)	M.A. Glasgow (1776)	Topography, limestone quarries and fossils. Noted effect on fish in river Cart of lime run off from fields. Described woods of Cart valley, critical of their poor management and argued for their conservation.
Patrick Graham (1750-1835)	Aberfoyle, Perth (1787-1835)	M.A. Glasgow (1776),	Landscape formation and agriculture, with implicit criticism of Hutton. Published <i>Sketches descriptive of Picturesque Scenery on the Southern Confines of Perthshire</i> and two volumes of the county agricultural surveys (Stirling; and Kinross and Clackmannan). ³
James Lapslie (1754-1824)	Campsie, Stirling (1783- 1824)	Glasgow	Landforms; climate, especially rainfall; woods and woodland products; birdlife with a table of migratory species; geology, especially coal measures. His interest in natural history was matched by an intense dislike of political radicalism. 'In 1793 he exerted himself to procure the conviction of Thomas Muir of Huntershill, and was a keen supporter of the government, on account of which his manse offices were maliciously set on fire 1797.' ⁴
James Little (1747-1811)	Colvend and Southwick, Kirkcudbright (1775-1811)	?	Topography and coastline of the parish, the Solway and its navigation; mammals of the parish and sea anemones (polypus). Suggested the strength of south westerly winds might be due to volcanic eruptions on the seabed.
Michael MacCulloch (1734-1801)	Bothwell, Lanark (1767-1801)	M.A. Glasgow (1758);	Described the Clyde valley, its estates and houses and landscaping using the language of the picturesque; plantations and an orchard he created in the glebe.
David Mackay (1752-1835)	Reay, Caithness (1783-1835)	M.A. King's College Aberdeen (1776)	Sea fish, seaware' (seaweed, shells, etc.); hills, minerals and caves of the parish; a detailed list of the birds of the parish. His daughter caused a minor

² David J. Galloway, 'John Lightfoot (1735–1788) and the lichens of Flora Scotica (1777)', *The Lichenologist*, vol. 46 (2014), pp. 247-260.

³ Patrick Graham, *General View of the Agriculture of Stirlingshire* (Edinburgh, 1812); *General View of the Agriculture of Kinross and Clackmannan* (Edinburgh, 1815).

⁴ *Fasti*, vol. III, p 377.

Minister	Parish	Education	Principal items described in the accounts and other sources
			sensation in 1809 with the publication of a letter in which she claimed to have seen a mermaid on the coast. ⁵
William Mackenzie (1734-1816)	Assynt, Sutherland (1765-1816)	M.A. Marischal College Aberdeen (1755)	Topography, including rivers, lochs, caves, coast, islands and soils; climate and the impact of heavy and persistent rain on life and farming. Discussed the evidence for volcanic landforms in the parish and concluded that it was strong.
Donald MacNicol (1735-1802)	Lismore and Appin, Argyll (1766-1802)	M.A. St. Andrews (1756)	Topography and soil of Lismore, noting the island was composed entirely of limestone; the rivers, hills and lochs, animals and birds; minerals including a marl bed in an island loch; fossil shells in the limestone; the orientation of limestone beds; the remains of large bones and horns of elk or cattle of great size; coasts and currents; and the slate quarry at Ballachulish. MacNicol was a Gaelic scholar and poet who also published a critical account of Samuel Johnson's <i>Journey to the Western Isles of Scotland</i> . ⁶
Patrick Maxwell (1747-1806)	Kilbarchan, (1787-1806)	M.A. Glasgow (1767)	Rivers of the parish, peat bogs and the ancient tree stumps they contained. Discussed the origin of mosses, noting that peat deepens with age; suggested that the Romans were responsible for much timber felling. Described rocks, coal measures and soils, and a large rock in the parish he believed was used for pre-Christian worship.
George Maxwell (1763?-1807)	Buittle, Kirkcudbright (1785-1807)	?	Topography and antiquity of farming in the parish; vegetation, orchards, and climate, suggesting that it was getting colder. Described marine 'animal flowers' or polypus (anemones) and birds. He noted that birds were indicators of environmental change, (for example, the appearance of crossbills following the planting of conifers and the disappearance of game birds following the conversion of moorland to grazing).
Thomas McCourty (1718?-1803)	Penicuik, Edinburgh (1772-1803)	?	Topography and geology of the Pentlands, including whinstone, clay, lime and coal measures; fossil and remains of elk, using Linnaean terminology. Discussed Wernerian theory of earth history and commented on the failure of philosophy 'to discover the internal structure of the earth, so as to ascertain

⁵ Katie Garner, 'The Caithness Mermaid, Female Testimony, and the Production of Coastal Knowledge', *Romanticism on the Net*, no. 79 (2022) <https://ronjournal.openum.ca/s/6689>.

⁶ Donald MacNicol, *Remarks on Dr Samuel Johnson's Journey to the Hebrides* (London, 1779).

Minister	Parish	Education	Principal items described in the accounts and other sources
			the rules by which she has been formed'. ⁷ Detailed picturesque description of the landscape with copious literary and historical references. Included a detailed list of the flora and fauna.
Dugal McDougal (1757-1819)	Lochgoil-Head and Kilmorich, Argyll (1789-1819)	M.A. Glasgow (1777);	Coast and hills, noting that sheep grazing had changed the vegetation from heath to grass; minerals with a detailed description of caves; woods and removal of timber; sea fish and their seasonal appearance; birds including migratory birds; 'wild beasts' and their 'destruction'.
Charles McHardy (1747-1822)	Crathy and Braemar, Aberdeen (-)	M.A. King's College Aberdeen (1767)	Mountains and minerals; forests and woods with mention of tree stumps in peat; rivers and lochs; a detailed description of scheme to eradicate 'vermin' (foxes, eagles, etc.).
William McRitchie (1757-1837)	Clunie, Perth (1784-1837)	St Andrews	Mountains and moorland; lochs and freshwater fish, rivers and burns; birdlife including migratory birds; and botany (six pages) using Linnaean terminology. Suggested a botanical expedition across the parish, noting the medicinal and other uses of several species. Woods and plantations, their management and timber produced; minerals including quarrying of slates, and inclination of strata; peat containing remains of elk and other large animals. Included detailed list (three pages) of examples of extreme weather. Also published a meteorological register of the weather (1821-1824) and an account of a tour through Britain. ⁸
James Meek (1739-1810)	Cambuslang, Lanark (1774-1810); Moderator of General Assembly (1795)	M. A. Glasgow	Soil and rivers, the regularity of floods including the great flood of 1782; and a picturesque description of landscape; summary table of meteorological observations (1785 to 1791); carboniferous strata and other minerals. Collected meteorological data daily from 1785 to 1809 along with detailed descriptions of the weather, farming, agricultural market prices and related information.

⁷ Appendix for Penicuik, County of Edinburgh, OSA, vol. XVII, 1796, p.606.

⁸ William MacRitchie, 'Meteorological Register for the Years 1821, 1822, 1823, and 1824, kept at the Manse of Clunie, Perthshire', *Edinburgh Philosophical Journal*, vol. 13 (1825), pp. 354-355; William MacRitchie, *Diary of a Tour through Great Britain in 1795* (London, 1897).

Minister	Parish	Education	Principal items described in the accounts and other sources
George Moir (1741-1818)	Peterhead, Aberdeen (1763-1818)	Marischal College, Aberdeen (1759)	The coast, with detailed descriptions of sea fish and fishing industry; extreme weather and the aurora; and a description of birdlife.
John Morison (1746-1798)	Canisbay, Caithness (1780-1798)	King's College, Aberdeen (1771)	Topography and Caithness heathlands, climate; with a detailed description of coast, tides and kelp; animals and birds; description of the Pentland Firth, its tides and currents.
Arthur Oughterson (1736-1822)	West Kilbride, Ayr (1771-1822)	Glasgow	Topography of Clyde coast; a detailed description of soils, and use of lime; Ardneil Point, its rocks and vegetation; discussed evidence for higher sea levels in the past, and the sedimentary or volcanic origins of rocks (concludes in favour of sedimentary). Included a picturesque description of hills.
John Paton (1755-1835)	Lasswade, Edinburgh (1783-1835)	?	Minerals, especially coal and the complex stratigraphy of the carboniferous rocks underlying the parish; picturesque description of the landscape and river Esk.
Archibald Reid (1744-1803)	Greenock (1781-1792)	Glasgow	Minerals and their possible igneous origin, topography and views from hills; clouds and valley fogs; species of shellfish and birds; raised beaches and evidence for higher sea levels in the past.
Robert Rennie (1767-1820)	Kilsyth, Stirling (1789-1820)	M.A. Glasgow (1781)	The hills and Kelvin valley; farmland drainage; decline in fish population associated with use of agricultural lime and pollution from flax production; minerals including iron stone, limestone, petrified shells; exploration for copper; basalt, white free stone for buildings; petrified trees and 'coal stalks'; coal seams and mines. Description of birdlife includes a table of arrival of migratory species. Also the author of two volumes of essays on the natural history of peat bogs. ⁹
James Robertson (? -1812)	Callander, Perth (1768-1812)	M.A. St Andrews;	Topography, and the 'romantic prospects' of the Trossachs; mountains and lochs; minerals including slates. Discusses whether pudding stone is of volcanic or sedimentary origin. Dismisses 'philosophers' who have debated the origins of rocks (naming Buffon). Suggested mountain chains may help hold together the surface of the earth. Animals and birds, fish and freshwater mussels, woods and plantations, and wild plants (referenced Lightfoot's <i>Flora</i>

⁹ Robert Rennie, *Essays on the Natural History and Origin of Peat Moss*, 2 vols. (Edinburgh, 1807, 1810).

Minister	Parish	Education	Principal items described in the accounts and other sources
			<i>Scotica</i>). Robertson was also author of three volumes of the county agricultural surveys (Perth, Inverness and Kincardine). ¹⁰
Joseph Smith (1750-1831)	Birse, Aberdeen (1789-1831)	M.A. Marischal College Aberdeen (1771)	Hills, upland flora and the remains of oak trees in peat. Included a detailed list of birds, a description of the River Dee and its salmon.
Andrew Spence (1761-1844)	Cockburnspath, Berwick, (1789-1844)	?	Coast and the geology of the parish, mentioning the arrangement of rocks at Siccar point: 'a scene highly interesting to those who attend to the mineralogical history of the globe'; also woodland and plantations. ¹¹
John Stuart (1743-1821)	Luss, Dunbarton (1777-1821)	Edinburgh, D.D. Glasgow (1795)	Natural history of the parish including soil, surface, climate; Loch Lomond and its islands, suggesting a small tsunami on the loch was due to the Lisbon earthquake; oak woods and their management. Includes five detailed tables listing animal species (quadrupeds, land birds, waterfowls, reptiles and fish). Stuart was also a Gaelic scholar who completed translation of the Old Testament into Gaelic.
John Thompson (1741-1822)	Markinch, Fife (1785-1800)	D.D. Edinburgh (1789)	River Leven; minerals and fossils (including marl deposits and freestone) with a detailed discussion (twelve pages) of coal deposits, including the history of mining in the parish, the main seams with their thickness, associated strata, the variety of types of coal, and problems of drainage. He predicted exhaustion of the coal fields due to their rapid exploitation. Author of the agricultural survey of Fife. ¹²
David Ure (1749-1798)	East Kilbride, Lanark (1783-1790)	M.A. Glasgow (1776)	Minerals, particularly coal and iron stone, and fossils. Also author of accounts of Rutherglen and Killearn where he described rare plants using Linnaean terminology, native and plantation trees; and gave a detailed description of minerals. Author of <i>The History of Rutherglen and East Kilbride</i> containing detailed descriptions of natural history and fossils. ¹³ Also prepared three

¹⁰James Robertson, *View of the Agriculture in the County of Perth* (Edinburgh, 1799); *General View of the Agriculture in the County of Inverness* (1808); and *General View of the Agriculture in the County of Kincardine* (Edinburgh, 1811).

¹¹ Cockburnspath, County of Berwick, OSA, Vol. XIII, 1794, p. 222.

¹² John Thompson, *General View of the Agriculture of the County of Fife* (Edinburgh, 1800).

¹³ David Ure, *The History of Rutherglen and East Kilbride* (Glasgow, 1793).

Minister	Parish	Education	Principal items described in the accounts and other sources
			volumes of the county agricultural surveys (Roxburgh, Dumbarton and Kinross). ¹⁴
John Walker (1731-1803)	Colinton, Edinburgh (1783-1803), Moderator of General Assembly (1790)	Edinburgh,	The water of Leith and its mills, also contributed to the account of Glencorse. Walker was one of Scotland's leading natural historians, Professor of Natural History in the University of Edinburgh (1779-1803) whose lectures were attended by many members of the clergy.
William Walker (1748?-1797)	St Cyrus, Kincardine (1781-1797)	M.A. (Marischal College, Aberdeen, 1768	Topography of the parish, soil and effect of heavy rain; included a detailed description of salmon fishing in the river North Esk involving the killing of seals; the coast; minerals including limestone and its quarrying, freestone and puddingstone. Included a list of 34 plant species found in the parish with critical comments on Lightfoot's <i>Flora Scotica</i> .
James Woodrow (1730-1810)	Stevenston, Ayr (1759-1810)	M.A. Glasgow (1750)	The coast, sand dunes and their changing morphology, alterations to the course of the river Garnock; and the variety of soils. Described in detail minerals, including freestone, limestone, and coal measures, with an account (eight pages) of coal mining, its history, and geology, including a cross-sectional diagram of coal seams under the parish. A volume of his correspondence with Samuel Kendrick has been published. ¹⁵

¹⁴ David Ure, *General View of the Agriculture in the County of Dumbarton* (Edinburgh, 1794); *General View of the Agriculture of the County of Kinross* (Edinburgh, 1797); *General View of the Agriculture of the County of Roxburgh* (Edinburgh, 1794).

¹⁵ Martin Fitzpatrick, Emma Macleod, and Anthony Page (eds.), *The Wodrow-Kenrick Correspondence 1750-1810, Vol. 1, 1750-1783* (Oxford, 2020).

Appendix Two: Churchmen who were Foundation Members of the Royal Society of Edinburgh

This appendix lists churchmen who were founding members of the RSE with brief details of their background and interests, from lists published in the Transactions of the RSE and other sources.¹⁶ Of the 166 foundation members of the RSE across Britain and Ireland, 38 were members of the clergy (15 resident in Edinburgh and 23 non-resident members). All were members of the Church of Scotland except William Trail, who was an Episcopalian.

Table 3: Churchmen who were resident members of the RSE

Name	Status as recorded in Transactions	Notes
Hugh Blair, D. D. (1718-1800)	Emeritus Professor of Rhetoric and Belles Lettres in the University of Edinburgh	Also minister at the High Kirk of St Giles
Andrew Dalzel, M. A. (1742–1806)	Professor of Greek in the University of Edinburgh	Unlicensed but studied theology at Edinburgh, unsuccessfully applied to be clerk to General Assembly 1789
Adam Ferguson, LL. D. (1723-1816)	Emeritus Professor of Philosophy in the University of Edinburgh	Chaplain to the Black Watch (1745-1754)
William Greenfield, M. A. (1754-1827)	Professor of Rhetoric in the University of Edinburgh	Moderator of the General Assembly 1796
Robert Hamilton, D. D. (1707-1787)	Emeritus Professor of Divinity in the University of Edinburgh	Moderator of the General Assembly 1760
Robert Henry, D. D. (1718-1790)	One of the Ministers of Edinburgh	Moderator of the General Assembly 1774, historian
John Home, Esq. (1722-1808)	Minister of Athelstaneford (1746-1757)	Author of the play ‘Douglas’, later MP for Edinburgh
Andrew Hunter, D. D. (1743-1809)	Professor of Divinity in the University of Edinburgh	Moderator of the General Assembly 1792, minister Tron Kirk, Edinburgh (1786-1809). Member of the popular party

¹⁶ *Transactions RSE*, vol. I (Edinburgh, 1788), pp. 83-93; also, FFRSE and ODNB.

Name	Status as recorded in Transactions	Notes
William Lothian, D. D. (1740-1783)	Minister of Canongate	Historian
John Macfarlan, D. D. (1740-1788)	Minister of Canongate, and Almoner to his Majesty	Secretary, SPCK, member of the 'popular party'
John Playfair, M. A. (1748-1819)	Professor of Mathematics in the University of Edinburgh	Minister at Benvie (1773-1782), author of <i>Illustrations of the Huttonian Theory of the Earth</i> (1802)
12 James Robertson, D. D. (1714-1795)	Professor of Oriental Languages in the University of Edinburgh	Minister at Cromarty (1744-1749)
13 William Robertson, D. D. (1721-1793)	Principal of the University of Edinburgh	Minister at Greyfriars (1761-1793), Moderator of the General Assembly 1763, historian
Matthew Stewart, D. D. (1717-1785)	Emeritus Professor of Mathematics in the University of Edinburgh	Studied theology at Edinburgh, minister at Rosneath (1745-46)
John Walker, D. D., M. D. (1731-1803)	Regius Professor of Natural History, and Keeper of the Museum in the University of Edinburgh	Minister at Colinton (1783-1803), Moderator of the General Assembly 1790, author of OSA account of Clinton

Table 4: Churchmen who were non-resident members of RSE

Name	Status recorded in the Transactions	Notes
Archibald Arthur, M. A. (1744-1797)	Professor of Moral Philosophy in the University of Glasgow	University chaplain from (1774-1794)
James Beattie, LL. D. (1735-1803)	Professor of Logic and Moral Philosophy, Marischal College, Aberdeen	Author of <i>Evidences of the Christian Religion; Briefly and plainly stated</i> ¹⁷
George Campbell, D. D. (1719-1796)	Principal of Marischal College, Aberdeen	Formerly minister at Banchory and Aberdeen
Alexander Carlyle, D. D. (1722-1805)	Minister of Inveresk, and Chaplain in ordinary to his Majesty	Moderator of the General Assembly 1770, author of OSA account for Inveresk

¹⁷ James Beattie, *Evidences of the Christian Religion; Briefly and Plainly Stated* (Edinburgh, 1786).

Name	Status recorded in the Transactions	Notes
John Chalmers, D. D. (1712-1800)	Principal of King's College, Aberdeen	Minister and Regent 1740, farmer at Sclattie near Aberdeen
Robert Findlay, D. D. (1721-1814)	Professor of Divinity in the University of Glasgow	Minister (1744-1782) when appointed to chair
Alexander Gerard, D. D. (1728-1795)	Professor of Divinity, King's College, Aberdeen	Moderator of General Assembly 1764
James Gillespie, D. D. (1722-1791)	Principal of New College, St Andrew's	Moderator of General Assembly 1779
Henry Grieve, D.D. (1722-1791)	Minister of Dalkeith, and Chaplain in ordinary to his Majesty	Moderator of General Assembly 1783, farmer
George Hill, D. D. (1750-1819)	Professor of Divinity in the University of St Andrews	Moderator of General Assembly, 1789
John Logan, (1748-1788)	Minister of South Leith	At South Leith 1773-1786
Joseph McCormick, D. D. (1733-1799)	Principal of the United College of St Salvator and St Leonard, St Andrew's	Moderator of General Assembly 1782
Hugh M'Leod, D. D. (1730-1809)	Professor of Church History in the University of Glasgow	Librarian, King's College, Aberdeen (1756-59)
John Main, D. D. (1728-1795)	Minister of Newton	Author of the OSA account of Newton (county of Edinburgh)
Thomas Reid, D. D. (1710-1796)	Emeritus Professor of Moral Philosophy in the University of Glasgow	Replaced Adam Smith in Glasgow, author of <i>Common Sense</i>
Thomas Robertson (1745-1799)	Minister of Dalmeny	Historian, author of the OSA account of Dalmeny
Robert Small, D. D. (1732-1808)	Minister of Dundee	Moderator of General Assembly 1791, mathematician, astronomer, author of OSA account of Dundee.
Harry Spens, D. D. (c.1714-1787)	Professor of Divinity in the University of St Andrew's.	Moderator of General Assembly 1780
Reverend Mr John Stewart (1743-1821)	Minister of Luss	Gaelic scholar, author of OSA account for Luss
John Stuart, A. M. (1751-1827)	Professor of Greek, Marischal College,	Minister at Fordun from 1775, appointed to Chair 1782

Name	Status recorded in the Transactions	Notes
William Trail, D. D. (1746-1831)	Prebendary of Down	Mathematician and minister, episcopalian
James Williamson, D. D. (1725–1795)	Professor of Mathematics in the University of Glasgow.	Minister (1755-1762)
Reverend Charles Wilson, D. D.	Professor of Hebrew in the University of St Andrew's.	

Appendix Three: List of Theology Students, Preachers and Ministers Attending the Natural History Classes of John Walker, 1782–1800

The table shows the name of the students, the year they attended the classes, their location and status as recorded by Walker and published by Matthew Eddy. Supplementary details from the Fasti and other sources have been added in brackets.¹⁸

(TS = Theology Student)

	Name and date,	Location	Status /notes
1	Baird, [?] 1786		Preacher
2	Baird, James 1793		Preacher
3	Bryce, James 1791	Edinburgh	TS (later minister of Gilcomston?)
4	Burton, Robert 1797	Edinburgh	TS
5	Cunningham, Charles 1794	Edinburgh	TS
6	Douglas, Alexander 1797		TS
7	Forbes, Duncan 1796	Edinburgh	Preacher
8	Forrest, Abraham 1789		Preacher
9	Garnock, Henry AM 1796		Preacher (1768-1820 minister Canongate kirk 1811 to 1820?)
10	Glendenning, Robert 1783		TS
11	Hall, James 1789		Preacher
12	Hughes, James 1785	Corstophine?	TS
13	Hunter, Rev. Dr Andrew 1798	University of Edinburgh	Professor of Divinity (1779-1809)
14	Hunter, James 1784		Preacher
15	Ker, ?1786		Preacher
16	Laurie, ? 1784		Preacher

¹⁸ Source: M.D. Eddy, 'The University of Edinburgh natural history class lists 1782–1800', *Archives of Natural History*, vol. 30 (2003), pp. 97–117.

	Name and date,	Location	Status /notes
17	Leyden, John AM 1797	Roxburghshire	TS, Tutor to William and George Campbell of Fairfield (John Caspar Leyden, M.D.1775 – 28 August 1811, trained in theology was a Scottish Indologist)
18	Lorimer, ? 1792	Dumfriesshire	Preacher
19	MacBeth, Patrick 1791		Preacher
20	McFarlane, Frederick 1784		TS
21	Macknight, Thomas 1797	Leith	Minister (Thomas MacKnight FRSE FSA MWS (1762–1836) Moderator of the General Assembly 1820, physicist, mathematician and Wernerian geologist)
22	Mcnight, Samuel 1784		Preacher W.S. (1757-1807) (Brother of Thomas MacKnight)
23	Mcrobert, Rev. 1782 minister	Shetland	Minister
24	Millar, James 1795	Ayrshire	Preacher
25	Miller, Daniel 1800		Missionary
26	Mitchell, James 1800		Preacher
27	Muir, Thomas 1791		Preacher
28	Muir, Thomas 1793		TS (not certain if this is the same Thomas Muir as in no. 27)
29	Niven, Alexander 1792	Ayrshire	Preacher, Archibald Hamilton's tutor. (1759- 1833) (later minister at Dunkeld, D.D. St. Andrews 1816)
30	Playfair, Rev. Mr John 1782	Edinburgh	Professor of Mathematics Edinburgh (1785-1805) (Prof of Natural Philosophy (1805-1819), author of the <i>Illustrations of the Huttonian Theory of the Earth</i> (1802))
31	Renoüard, Rev. John Henry 1795 AM (Cantab.)		Proctor Trinity College, Cambridge 1804
32	Rodgers, ? 1799	Collace, Perthshire	Preacher (The Rev. John Rogers, 1764-1851, Minister. Author of NSA for parish of Collace 1837)
33	Rogers, John MA 1793		Preacher (maybe the same as 32?)
34	Rogerson, William 1783		TS
35	Sandford, Rev. Daniel AM (Oxon.) 1796	Edinburgh	(Scottish Episcopal Church, vicar at Charlotte Chapel)

	Name and date,	Location	Status /notes
36	Smith, James 1795	Edinburgh	Preacher
37	Stewart, Andrew 1796		Preacher
38	Stuart, Rev. John 1782	Luss	Minister (author of OSA account for Luss 1796)
39	Stuart, Peter 1782	Breadalbane	Preacher
40	Thomson, James 1795	Perthshire	Preacher
41	Trotter, John 1782		Preacher
42	Tweedie, John 1782		TS
43	Walker, James 1798		TS, Tutor to John and Hugh Hope, sons of Sir Archibald Hope. (1770 – 1841) (Bishop of Edinburgh (1830–1841) and Primus of the Scottish Episcopal Church (1837–1841). FRSE)
44	Walker, John 1784		Preacher
45	Wallace, James 1793	Dumfriesshire	TS (son of James Wallace minister of Keir from 1777-1794?)
46	Wightman, John 1792		Preacher
47	Williamson, John 1797		TS, Lord Ashburton's tutor.

Appendix Four: Ministers Mentioned in Thomas Pennant's Tour of 1772

For Pennant, ministers played an important role as hosts, informants and correspondents. The table lists those ministers recorded by Pennant, with further information from the *Fasti* where available.¹⁹

Name and other details as recorded by Pennant	Notes from Fasti
Rev. Jaffray, Ruthwell, Dumfries	Andrew Jaffray (?-1795), minister at Ruthwell (1760-1783), subsequently minister and author of the statistical account for Lochmaben.
Duncan MacFarlane, Minister at Drymen	Duncan MacFarlane (1708-1791), minister at Drymen from 1743. 'He was a man of great shrewdness and vigour of mind; took a considerable interest in the affairs of the Church, and was a firm supporter of patronage.' ²⁰
Donald Macquin, Kilmuir, Skye,	Donald MacQueen (?-1785) minister at Kilmuir in Trotternish from 1740. 'He was probably the best known and most distinguished minister in the Highlands in his time. Thomas Pennant, who had a previous correspondence with him, visited him during his tour in Skye in 1772, and to the English traveller he gave much of the valuable information used by him in his Tour in Scotland (1772).' Accompanied Dr Johnson and Boswell in their tour of the island (1773). ²¹
Rev Dounie, Minister at Gairloch,	John Downie (1727-1811), M.A. Kings College Aberdeen (1752), minister at Gairloch (1758-1773), later at Stornoway, and then at Urray and Tarradale, Inverness, hosted Pennant at the manse in 1772. Wrote the account of the parish of Urray and Tarradale. ²²
Donald MacLeod, Minister at Glenelg,	Donald MacLeod (1729?-1781), minister from 1756.
Dr John Macpherson, minister at Sleat in Skye, Pennant notes his assistance in writing the account.	Probably Martin MacPherson (1743-1812), son of John MacPherson (1713-1765). M.A. King's College, Aberdeen (1764), minister from 1765, D.D. King's College, Aberdeen, (1803). Entertained Dr Johnson and Boswell in 1773. Wrote the account of the parish. ²³

¹⁹ Thomas Pennant, *A Tour of Scotland and Voyage to the Hebrides 1772* (Edinburgh, 1998).

²⁰ *Fasti*, vol. III, p. 339.

²¹ *Fasti*, vol. VII, p. 171-172.

²² *Fasti*, vol. VII, p. 50.

²³ *Fasti*, vol. VII, p. 175.

Mr Lindsay, Minister at Lochranza, Arran	James Lindsay (1724-1778), catechist 1752 at Lochranza.
Minister on Gigha (not named)	William Mouat or Mowat (?-1784), minister at Gigha from 1758-1784. ²⁴
Rev Mr. Macintyre, Glenurchie	Joseph MacIntyre (1735-1823) M.A. St Andrews (1756) ; minister from 1765; D.D. St Andrews (1783). Wrote the account of the Parish.
Rev Dr Ferguson, Mouline	Adam Fergusson (1706-1785), minister at Moilin near Pilochry from 1736. Moderator of the General Assembly (1772).
Rev Mr Bisset, Logierait	Thomas Bisset (? – 1800) M.A. St Andrews (1750); minister from 1755, D.D. St Andrews (1787). Wrote the account of the parish. ²⁵
Rev Mr Duff, Tibbirmoor.	Alexander Duff (?-1785) M.A. St Andrews (1752) ; minister of Tibbermore near Perth from 1762.
Rev Mr Scott, Meigle	Alexander Scott (1707?-1776) M.A. King's College, Aberdeen (1727); minister from 1757.
Rev Mr Bell, Aberbrothric.	William Bell (1720-1775) Marischal College, Aberdeen; minister at Arbroath from 1748.

²⁴ Fasti, vol. IV, p. 54.

²⁵ Fasti, vol. IV, p. 189.