Science and the language of Natural History Museum architecture

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Science and the Language of Natural History Museum Architecture: Problems of Interpretation[1]

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Abstract

The historicist styles and decorative schemas of natural history museums built from the 1850s to the 1930s provide a unique opportunity to study the architectural expression of scientific ideas. At the same time, the significance of individual buildings varies widely. Drawing on examples from Britain, Ireland, Canada and continental Europe, this article explores three specific problems that arise in the interpretation of the architectural language of natural history museums. Firstly, the same motifs can convey very different meanings in different places. Secondly, the same governing idea can be communicated through different architectural styles which in turn inflect the idea itself. Finally, it is often hard to reconstruct the exact roles of the different actors in creating a museum building. The most complex museums, and the most challenging and rewarding to analyze, are those with the greatest number of scientists and artists working together to create them.

Key words: Natural History Museums; architecture; decorative arts; natural theology; evolution.

In June 1855, Henry Acland, Physician at the Radcliffe Infirmary and Lee's Reader of Anatomy at Christ Church, addressed the Oxford Architectural Society on the subject of the University's new museum of natural history:

> Oxford was about to perform an experiment; it was about to try how Gothic art could deal with those railway materials, iron and glass; and he was convinced, when the interior court of this museum was seen, – with its roof of glass, supported by shafts of iron, while the pillars and columns around were composed of variously coloured marbles, illustrating different geological strata and ages of the world, and the capitals represented the several descriptions of floras, – that it would be felt that problems had been solved of the greatest importance to architecture (Oxford Architectural Society 1856: 70-71).

The Oxford University Museum would not just be a space 'for teaching and studying the Natural History of the Earth and its Inhabitants' (Oxford Museum Committee 1849), as the University had originally intended. It was going to epitomize science and nature in its very fabric. The iron and glass roof would vaunt the ambition and the aesthetics of modern industrial technologies, while the columns would form a physical encyclopaedia of botany and geology. The entire project was to be an experiment in engineering, pedagogy and art.

The immediate 'problem' to be solved – how 'to use what are called the materials of the nineteenth century, at once with perfect freedom, and with perfect agreement with the English style of the thirteenth' (Oxford Architectural Society 1856: 69) – was not merely a matter of arbitrary fashion. The University, Acland told his listeners, 'had selected a Gothic design as fittest for a purpose altogether new' (Oxford Architectural Society 1856: 70). Two years earlier, before the competition to design the museum was launched, George Edmund Street, the diocesan architect for Oxford, had argued that a Gothic style would be most appropriate for the new museum. Gothic was itself supremely scientific. Through the invention of the pointed arch, it had achieved the greatest of all 'mechanical advantages' in the history of architecture (Street 1853: 4).

The aesthetics of Gothic were equally fit for purpose. As Street remarked:

> there seems to be a peculiar propriety in selecting the style, which above all others that have ever existed, took nature and natural forms for her guide and her ornaments, in a Museum intended mainly for the reception of a collection illustrative of Natural History (17).

Street stressed the sympathy between Gothic architecture and nature. Acland and the new museum's keeper, the geologist John Phillips, took this a stage further. By drawing on the heritage of Gothic, they realized that the museum building itself could become a vehicle for the interpretation of the natural sciences. This was the 'purpose altogether new' that Acland had in mind.

The Oxford University Museum opened in 1860. It set a precedent for natural history museums to use architecture and art in communicating and interpreting science. This special issue is dedicated to considering the properties of things within museums. I want to extend this brief to consider the properties of the museum buildings themselves, as the things that contain museum objects, shaping in more or less subliminal ways our thinking about them as we encounter them. Stefanie Jovanović-Kruspel has characterized the Naturhistorisches Museum in Vienna, which opened in 1889, as a *Gesamtkunstwerk* or 'total work of art' (Jovanović-Kruspel 2017: 14). Although it derives from different architectural and intellectual traditions, and remains incomplete, the Oxford University Museum is similarly totalizing, combining structural engineering, materials and decorative art to create a comprehensive yet distinctive vision of the natural world as understood by science.

These two museums are the most thorough-going examples of the expression of natural history as a science through architecture and the decorative arts. In this article I will explore how far other museums of natural history built from the 1850s to the 1930s in Europe and North America sought to achieve similar objectives in their architecture. More precisely, I want to consider three problems of interpretation that arise in seeking to trace whether, how and how far the architecture of a given natural history museum communicates a scientific worldview. The first problem is that the same architectural features can signify different meanings in different museums. This applies to the overall choice of style as well as to the choice of materials and decorative features such as relief sculpture. In individual cases, these may be determined as much by practical or political considerations as by the impetus to communicate science through architecture. The second problem is in effect the reverse of the first, as buildings can also use radically different styles to convey equivalent meanings. This raises the question of how the medium affects the message. How are similar scientific worldviews inflected differently through distinct architectures? Depending on archival records, it can be hard to establish how far correlations between the architecture and the scientists' worldviews amount to messaging and how far they may instead be an illusion created by a researcher's own confirmation bias. Of course, the buildings do not remain in the hands of those who created them – the architect and the scientist, like the author, are dead – but a robust scholarly interpretation still needs to recognize how far its meanings arise from recovered knowledge, imaginative reconstruction or merely the association of ideas. The third problem is that the relationships between architects, scientists and artists again differ widely. There are often many different players involved, so the aesthetic choices and scientific ideas in play may be multiple and in tension or even in conflict with one another.

Over the three sections of this article, I will examine each of these problems in turn by considering key cruxes that arise when we set museum buildings from different countries and different moments alongside one another. The first section will put the Oxford University Museum and the Natural History Museum in London into dialogue with museums in Dublin and Ottawa to show how the same architectural styles, materials and decorative motifs that signify scientific worldviews in some museums are redolent of local contexts and national ambitions in others. The second section will consider how far the different architectural styles and decorative schemas of the museums in Oxford and London, together with the Redpath Museum in Montreal and the Royal Ontario Museum in Toronto, imply contrasting inflections of the same conception of science as natural theology. In conclusion, I will revisit the composite

decorative schemas at the Oxford University Museum and the Naturhistorisches Museum, touching too on the anatomy and palaeontology galleries of the Muséum national d'Histoire naturelle at the Jardin des Plantes in Paris, to suggest that, given the diversity of scientists and artists involved in realizing these visions of the natural world, these buildings inevitably exceed any one conception of science. Each of these case studies shows the difficulty of demonstrating that science has shaped the architecture of a given museum in a particular way or even at all. Yet together they show how, in probing and testing this possibility, we can reveal in detail the distinctive properties of different museum buildings and the diverse stories built into their fabric. These stories in turn invite us to reconsider the category of the natural history museum itself, as structures and decorations that appear to identify individual museums with natural history or natural theology show themselves to have other properties altogether. [2]

Problem 1: Same Features, Different Meanings

In 1859, a year before the Oxford University Museum opened, Richard Owen, the Superintendent of the Natural History Departments at the British Museum, had prepared a report for the British Museum's Trustees arguing the case for a new museum building dedicated to their natural history collections (Stearn 1998: 41-2). After five years of campaigning by Owen, with the support of William Gladstone, then Chancellor of the Exchequer, the competition to build a new museum in South Kensington was announced. Due to the death of the winning architect Francis Fowke, disputes over the site and changes of government, it would be another seventeen years before the new museum finally opened to the public in 1881.

Like the Oxford museum, the British Museum (Natural History) – always known as the Natural History Museum – was built to enshrine scientific knowledge and principles in its architecture.[3] At Oxford, Acland and Phillips collaborated with the architect Benjamin Woodward and the architectural theorist John Ruskin, as well as with individual designers, sculptors, metalworkers and painters, to realize their conception of a Gothic natural history museum. In London, Owen worked similarly closely with Alfred Waterhouse, providing him with prospective floor-plans and with scientific illustrations on which to base designs for the terracotta menagerie which would dominate its decorative scheme. Owen had initially been sceptical of Oxford's choice of a Gothic style for its museum, on the grounds that, as he wrote to Acland, 'The sciences were not born nor nursed where that style originated' (quoted in Rupke 2009: 253). When it came to building the Natural History Museum, however, he was persuaded by Waterhouse to adopt the round-arched Romanesque style from which Gothic derived on the grounds that 'No style could better lend itself to the introduction, for legitimate ornamentation, of the endless beautiful varieties of form and surface-sculpture exemplified in the animal and vegetable kingdoms' (Owen 1881: 10). Both museums, then, ended up employing medieval architectural styles to give physical form to modern scientific worldviews.

The Oxford University Museum and the Natural History Museum belong to a lineage of medievalist natural history museums built across the English-speaking world from the 1850s to the 1930s. Phillip Kent (2000) has placed the Natural History Museum alongside other Romanesque museums specialising in natural history, including the Smithsonian Institute in Washington, D.C., which opened in 1855; the American Museum of Natural History in New York, which started with a neo-Gothic building in 1877 and expanded into new Romanesque Revival buildings completed in 1899; the Bernice Pauahi Bishop Museum in Hawaii, built in 1889; and the Horniman Museum in south London, which opened in 1901. Both the initial building of the Royal Ontario Museum in Toronto, which opened in 1914, and the substantial extension to the building, dating from 1933, are again Romanesque. The Trinity College Museum in Dublin (1857), the Manchester Museum (1888) and the Victoria Memorial Museum in Ottawa (1912), now the Canadian Museum of Nature, are respectively Venetian-Byzantine, Gothic and Scottish Baronial.

While these museums appear to share a broadly defined function and a heritage of medieval-revival architecture, the relationship between their architecture and their subject-matter is not consistent. This is clear when the differences, rather than the similarities, between these buildings and their particular medievalisms are brought to the fore. One crucial difference lies in the use of decoration. As Kent notes (2000: 4), besides the Natural History Museum, only

one of his set of Romanesque museums incorporated sculpture representing the natural world, and that was the Technological Museum in Sydney, which was not principally concerned with natural history. Samuel Alberti (2009: 32-8) has argued that William Boyd Dawkins, the first director of the Manchester Museum, rejected Owen's taxonomic curatorial principles in favour of a more evolutionary approach. Although they shared the same architect in Waterhouse, Dawkins's museum also rejected the overbearing and potentially constraining decorative schema of Owen's. The resulting building has a Gothic exterior but little decoration on the façade or in the interior to interfere with the interpretation of the collections. The effect is essentially the same as Waterhouse's other Gothic civic or university buildings, such as Reading Town Hall and the Victoria Building in Liverpool, both of which have subsequently become museums.

Even where museums of natural history share the same decorative features as those of the Oxford or London museums, they cannot be presumed to have the same meanings. The Museum Building at Trinity, Dublin, was built just ahead of the Oxford museum by the same firm of architects employing the same decorative artists. Both museums incorporate 'columns ... of variously coloured marbles', to use Acland's phrase, and exquisite natural historical carvings by John and James O'Shea and their nephew Edward Whelan. The Victoria Memorial Museum followed the Natural History Museum in London in being decorated with stereotype low relief sculpture, albeit in stone, not terracotta, depicting natural history. Yet a closer investigation of these two museums reveals that these decorative elements that bear on the scientific study of natural history at Oxford and in London serve different ends and convey different ideas in Dublin and Ottawa.

In both cases, the need to assert nationhood within an imperial system takes precedence over science. In September 1854, early in the construction of the Trinity College Museum Building, the trade magazine *The Builder* expressed its sincere hope that the museum would be 'worthy of the beautiful capital of beautiful Ireland' (Anon. 1854). Two years on, another article in the same magazine praised 'the native talent of three brothers, workmen, the O'Sheas, of Ballyhooly, county Cork', as revealed in their carvings at the museum:

> The ornature is for the most part wreathed in foliage – the oak, the ivy, acanthus, shamrock; lilies, lotuses, birds, and, in fact, every variety of wreath – and these so diverse, so diffuse, so graceful, that the very diversity establishes its beauty (Quondam 1856: 143).

Recent research at Trinity, led by the art historian Christine Casey and the museum's long-standing curator Patrick Wyse Jackson and sponsored by the Irish Research Council, has at last provided a thorough account of the Museum Building's architecture and its decorative art. Regarding the botanical and zoological carvings on its exterior and in its central atrium, this rich and comprehensive study has shown that 'While the Museum Building supports a number of non-native floral and faunal taxa, the majority of species are indeed Irish natives' (Wyse Jackson and Wyse Jackson 2019: 240). Building on earlier work by Wyse Jackson, Louise Caulfield has catalogued the museum's limestone and marble columns with precision for the same project. With one exception, they are all made of Irish stones (Wyse Jackson 1995; Caulfield 2019). Like the O'Sheas' carvings, they beautify the building in a manner befitting a national monument, as *The Builder* had hoped.

The exception is 'a dark reddish-black serpentine' from the Lizard peninsula in Cornwall, which Wyse Jackson had previously established was probably included because of the influence of Samuel Haughton, who 'had investigated the geology of the area only a short time previously' (1995: 152). Haughton was professor of geology at Trinity. He held strong opinions on science and natural history, becoming a determined opponent of Darwin's theories of evolution and natural selection (McDowell and Webb 1982: 242-3; McMillan 1988). But while he undertook a site investigation for the building (Cox 1993: 42-3) and appears to have advised on the choice of columns, unlike Acland, Phillips and Owen he did not apparently seek to set any particular scientific concept of nature in stone at the Museum Building (unless, as Paul Arnold has recently suggested, one particularly anthropomorphic monkey carved above the main entrance is 'a droll remark' (2019: 357) on evolution). Unlike the columns at Oxford, those at Trinity are not labelled and show no sign of being organized into a pattern illustrative of a scientific system. The same goes for the carvings. In the absence of a written schema like

that which Phillips prepared for the botanical carvings around the central court in Oxford, the researchers on the recent project on the museum have constructed a systematic catalogue of the carvings around the main hall and given detailed accounts of those around each wall of the exterior. Painstaking as these are, they provide little evidence of an organising principle that might confirm that there is a lost scientific schema underlying the decoration.

In another chapter from the recent collection on the Museum Building, Andrew Tierney points out that George Allman, professor of botany at Trinity College, was an early advocate of Ruskin's principles of truth to nature in art who gave a series of lectures on 'Botany as applied to the Arts' in the same year that the O'Sheas began their work on the new museum (2019: 209-11). The researchers working on the carvings suggest that 'the taxonomic fidelity of the internal capital carvings is excellent, as it is for the majority of the carvings on the exterior of the building' (Wyse Jackson and Wyse Jackson 2019: 234), apparently fulfilling the promise of Allman's teachings. Yet of the forty-four interior carvings catalogued, sixteen are either unidentified or generic while another two are listed as showing botanical inaccuracies (242-3). Furthermore, as they note:

> the internal capitals in the Museum Building differ from their later Oxford examples in that they exhibit essentially a mix of plant species assembled in much the same manner as a flower arranger or an artist setting up a still-life composition. These assemblages would not be encountered in nature or in a greenhouse (235-7).

For its part, the exterior carving combines 'skillfully rendered naturalistic subjects' (223) with tales from Aesop's fables (226), 'mythical species' (227) and some carvings which are 'very stylized' (230). This recent study of Trinity College Museum Building concludes that:

> through the placement of decorative stone columns and naturalistic carvings it served as a permanent repository and source of information on the geology and flora and fauna of Ireland and as such functioned as an oversized museum display (250).

But on these terms the carvings would also be also a source of disinformation, both because of their inaccuracies and uncertainties and because they include many exotic species such as orchids, parrots, old-world monkeys, a snake and an American eagle (240), as well as garden flowers and domestic animals. Moreover, 'taxonomic fidelity' at the species level is not sufficient to constitute a display of taxonomy. Mid-Victorian natural history was not just an observational but a systematic science. Allowing for the occasional inaccuracy and assuming that the unidentified plants may nonetheless represent specific types, Tierney's conclusion that the carvings are indicative of 'the collaboration of science and art' advocated by Allman is suggestive (2019: 212). But while it seems not unlikely that the O'Sheas' work at Trinity was encouraged and perhaps even guided by Allman in its aspiration towards fidelity to nature, without any clear organising pattern in the selection and arrangement of the carvings, whether biological or geographical, and in the absence of any corroborating evidence of involvement by the scientists who commissioned, curated and taught at the museum, it is hard to concur with the bolder conclusion that the Museum Building was a 'pioneering experiment' (Wyse Jackson and Wyse Jackson 2019: 250) in the use of natural history museum architecture to communicate the science of natural history.

After praising the natural bounty of the O'Sheas' carvings, *The Builder* undercuts any attempt to read this as representing a conception of nature itself by commending the fact that they have already been copied above a Dublin shop and predicting that they will soon be all the rage in England (Quondam 1856: 143). Ultimately, it is perhaps not surprising if the Museum Building at Trinity did not attempt to systematically articulate a conception of natural history in its architecture, as it was not built to be a natural history museum as such. Geology was taught at Trinity primarily within the engineering syllabus and, although the museum did display an impressive collection of fossils (Wyse Jackson 2019: 319-21), the building was referred to within Trinity as the Engineering School until the mid-twentieth century (Cox 1993: 38). It was more in keeping with this purpose for its architecture to display the structural and aesthetic potential of Irish stones, Irish workmanship and decoration derived largely from Irish animals and plants, wittily juxtaposed with the occasional well-known exotic or fable, than for

it to set out a particular scientific worldview. If Ireland could take a lead in construction and the decorative arts, the museum's architecture would have achieved its end.

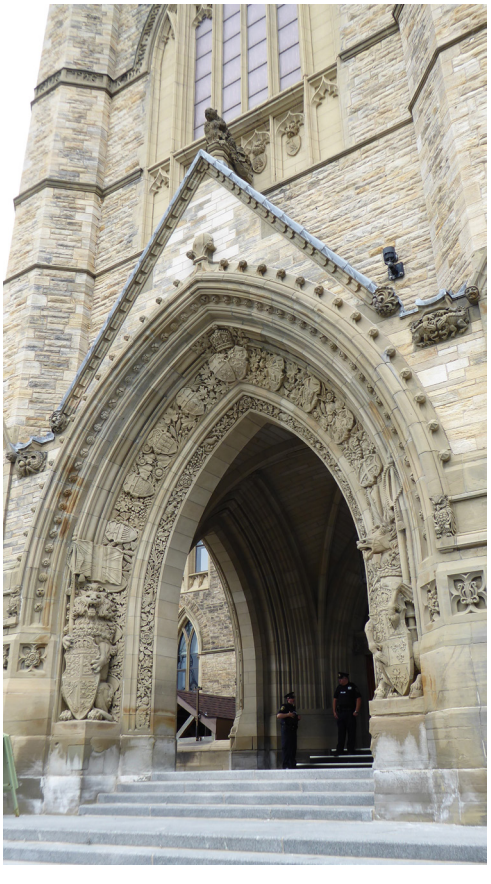
To read the Victoria Memorial Museum as a natural history museum is again a distortion of its actual role, projecting its current iteration as the Canadian Museum of Nature onto a building that was designed to house a national museum, with collections representing human as well as natural history.[4] As at Trinity, the museum's decorative schema contributes to this illusion. The Victoria Memorial Museum was built to be a mixed museum, yet its decoration is almost entirely natural historical. On the exterior walls of the museum it combines low-relief scenes depicting animals inhabiting their environments [fig 1] with more massive, approximately life-sized heads of large mammals [fig 2].

Fig. 1: Racoon, Canadian Museum of Nature, Ottawa. Author's photograph.

Fig. 2: Moose heads above main entrance, Canadian Museum of Nature, Ottawa. Author's photograph

Both these features are reminiscent of Waterhouse's designs for the Natural History Museum, albeit at once cruder and more naturalistic. The decoration is less sustained in the interior, but it includes occasional carvings, stained glass and a large mosaic of a bull moose in the entrance. Just as the decorative sculpture at the Trinity College Museum was dominated by Irish plants and that at the Technological Museum in Sydney 'incorporated a variety of native Australian fauna' (Kent 2000: 4), the natural history depicted on the walls, floors and windows of the Canadian Museum of Nature is specifically and exclusively Canadian. Like these earlier museums, the original Victoria Memorial Museum used natural history to make a statement about nationhood more than science.

What that statement was only becomes clear when the museum is put back into the history and geography of Canada's capital city. The museum was built at the south end of two large boulevards, Metcalfe and Elgin Streets. At the north end stood the Parliament. The two sites offer competing architectural symbols of Canada, built in different styles with different symbolism. The three main blocks of the Canadian Parliament, together with its Library, were all in a Gothic style. The Scottish Baronial style adopted by the Chief Dominion Architect David Ewart for several public buildings in Ottawa in the early twentieth century, including the Royal Mint and the Connaught Building as well as the museum, may seem merely a variation on a medieval theme, but its implications were quite different. Neo-Gothic was very much an English style, identified with the Houses of Parliament and the Church of England. Through its architecture, the Canadian Parliament affirmed its place within the British Empire, centred on



Figs 3 and 4: Main entrance and detail, Parliament Building, Ottawa. Author's photographs.

Westminster. The Scottish Baronial style, by contrast, asserted a quiet but confident independent identity. While it could express an alternative religious dispensation – G. A. Bremner notes that Scottish Baronial was used to assert the Church of Scotland's independent authority as an established church in St Andrew's church in Toronto (2013: 240-1) – it could also express a more secular identity. Where the Natural History Museum is a cathedral to Nature, the Victoria Memorial Museum asserts a manorial right to Canada through its natural history. The blank shields alongside the trophy heads of bears, moose and bison confirm this proprietorial claim, as the exterior walls of the museum resemble a laird's hall turned inside out.

The competing ideas of Canada embodied in the Parliament and the museum were played out in real time after a fire destroyed the central building of the Parliament in 1916. While Parliament itself was temporarily housed in the museum, the new Parliament building was constructed in a more flamboyantly Gothic style than ever. The intense contrast between the two buildings can be epitomized through one revealing detail: the symbolic role played by the beaver in their respective decorative schemes. In the museum, the beaver is one of many Canadian animals, identifying the nation with its distinctive fauna and by implication its open and still largely wild, though exploitable, land. This is a rugged vision of Canada, drawing on equally rugged Scottish antecedents. On the Parliament building, by contrast, the beaver sits atop the gable of the main porch, a small, almost comic creature dwarfed by the lion and the unicorn that flank the entrance [figs 3 and 4].

The new Canadian Parliament was at once grandiose and quirky, in keeping with the extravagance of the Gothic revival yet oddly self-deprecating about Canada itself. In stark contrast, while the name of the Victoria Memorial Museum acknowledged Canada's connection to the British monarchy, its architecture epitomized a proudly self-determined nation laying claim to its own domain.

Problem 2: Different Features, Same Meanings?

The Trinity College Museum and the Canadian Museum of Nature show how the aesthetic practices adopted at the natural history museums in Oxford and London could be used to promote particular national identities rather than scientific ideas. By contrast the Redpath Museum in Montreal and the Royal Ontario Museum in Toronto use very different architectural styles and motifs to intimate a similar scientific worldview to that promoted in Oxford and London. Here again, the distinctive properties of individual buildings, examined in the light of their own particular histories, reveal both the challenges of interpretation and the divergence between iterations of the same idea as they take different architectural forms.

The Oxford dons who campaigned for a new museum in the 1840s and 1850s were committed to a belief in natural theology. In the words of a catalogue to the old Ashmolean Museum drawn up by one of them, Philip Bury Duncan, before the collection was divided between the new Ashmolean and the University Museum, the aim of the natural history collections was 'to induce a mental habit of associating the view of natural phenomena with the conviction that they are the media of Divine manifestation' (Duncan 1836: vii). For Owen too, 'the purpose of a Museum of Natural History' was 'to set forth the extent and variety of the Creative Power, with the sole rational aim of imparting and diffusing that knowledge which begets the right spirit in which all Nature should be viewed' (1862: 11).

Both the Oxford University Museum and London's Natural History Museum use echoes of church architecture to reinforce this spirit of reverence for God's creation. In his presidential address to the British Association for the Advancement of Science in Cheltenham in 1856, Charles Daubeny, the professor of chemistry, botany and rural economy at Oxford, characterized the museum's central court, then under construction, as 'the Sanctuary of the Temple of Science, intended to include all those wonderful contrivances by which the Author of the Universe manifests Himself to His creatures' (1867: ii 172). To enter this space you pass through a door in an arch surmounted by an angel with Adam and Eve on either side. Opening another pair of doors, you step into a large open space with magnificent cast iron Gothic vaulting, arranged like the parallel aisles of a medieval church, supporting a ceiling of clear glass. The Christian inflexion of the Natural History Museum's Romanesque architecture is no less obvious. The two towers on either side of the main entrance derive from Waterhouse's

many studies of German church architecture made on trips up the Rhine in 1857 and 1861 (Bullen 2006: 273-6), while Waterhouse himself likened the museum's Central Hall, now Hintze Hall, to 'the Nave of a Cathedral' (1873).

As well as expressing a Christian exultation in Nature, the architecture of these two museums directly interprets the natural world through an ideal of science as the study of God's creation. Here, however, their messaging begins to diverge. Both museums followed Ruskin's precept that, as he put it in a letter to Acland published in the original guidebook to the Oxford museum, 'all art employed in decoration should be informative, conveying truthful statements about natural facts' (Acland and Ruskin 1893: 50-1). But the plans, forms and materials of the two museums and their art modify those statements, creating distinct visions of nature in spite of their shared commitment to natural theology.

In addition to being scientific, grounded in natural observation and Christian, Gothic had another advantage to recommend it as a style. As the Radcliffe Observer, the astronomer Manuel John Johnson, noted at a meeting of the delegates of the museum committee on 4 December 1854, Oxford's scientific departments and collections were so diverse that it would be ludicrous to try to fit them into a strictly symmetrical building: 'That kind of architecture, therefore, was to be preferred, which did not recognize symmetry as one of its essential conditions' (Oxford Museum Delegates 1853-58: 49). Gothic was flexible and accretive, allowing for different spaces for different sciences, and for new extensions and even new buildings to be added to the museum without damaging its unity. As the museum as a whole was built to allow it to grow, so its art encapsulates a vision of nature as growth. The species of plants carved on the capitals and corbels around the museum were selected by Phillips, but the plants themselves were carved from specimens brought from the University's botanic gardens (Tuckwell 1907: 52; Vernon and Vernon 1909: 79), so each carving represents a unique encounter between an individual artist and an individual plant.

As such, they match the Oxford museum's distinctive inflexion of natural theology. In a lecture on the new museum in 1858 which went on to form the basis of the museum's guidebook, Acland claimed that, while a scientific conception of Nature provided 'glimpses of unuttered ideas – traces ... of unexpressed Art of the great Artificer' (Acland and Ruskin 1893: 8), art in its turn could convey sparks of 'true light from the Beauty and the subtle Law which stamp the meanest work of the Everliving, Everworking, Artist' (56-7). In representing nature truthfully, the art within the museum pays homage to God's own artistry. This conception of God as the 'Everliving, Everworking, Artist' has two important implications as a revision of natural theology. Firstly, it implies that design in nature is not strictly utilitarian or mechanical, but both the product and a cause of artistic enjoyment. Secondly, it imagines creation as a continuous process, not an occasional event.

The version of natural theology built into the structure of the Natural History Museum in London is very different from the organic, personal and artistic model implied in Oxford. Waterhouse's building, derived ultimately from Owen's designs, is rigidly symmetrical. The east wing was to be dedicated to extinct forms, the west wing to living forms. The terracotta decorations mirror this schema, rupturing any sense of continuity between past and present creations. There was only one staircase, so to move from east to west, or even from one floor of the same wing to another, you had to move through the Central Hall. As the Hall itself resembled the nave of a cathedral, so the booths off to the side were individual chapels. These were built to house Owen's Index Museum, intended as a taxonomical digest of the whole of Nature.

The message that the natural world could be thoroughly compartmentalized and indexed was reinforced every time that you moved from one part of the building to another. Indeed the entire building was structured like a series of taxonomists' drawers on an immense scale. Again, Waterhouse's decorations reinforced this message, in this case through framed paintings of plants on the ceilings and low relief sculptures of animals on the walls and staircases, representing not living individuals but stylized types. Stereotyping can be achieved in stone, as in the decorations at the Canadian Museum of Nature, but the decision to use terracotta in London, which was a practical response to pollution and the risk of fire (Girouard 1999: 53, 61), further enhanced the impression of nature as a predetermined, replicable series of discrete phenomena, not a continually growing whole made up of unique lives.

Altogether, the version of natural theology implied by the architecture of the Natural

History Museum is perceptibly more rigid and conservative than that at the Oxford museum, stressing fixity where Oxford allows for change. There is a correlation here between their scientific worldviews and their historical moments, as the Natural History Museum postdates and responds to the shift towards Darwinism, evolution and scientific naturalism within British science from the 1860s onwards. Owen was Darwin's most respected and high-profile opponent. He rejected the methodological materialism of the scientific naturalists and only accepted evolution on the presumption that it was divinely orchestrated through decisive steps or saltations, not driven by natural selection through the accumulation of small changes. His collaboration with Waterhouse can be seen as a rear-guard action to defend a beleaguered conception of science by setting it in stone. Many of the founders of the Oxford museum shared Owen's doubts about Darwin, but their museum was designed before *On the Origin of Species* was published, in blissful ignorance of natural selection and on principles which proved more readily compatible with many other aspects of Darwin's science, including its gradualism, the anti-utilitarian logic of sexual selection and his overarching organic metaphor of the Tree of Life.

It is possible to trace the distinct interpretations of natural theology built into the natural history museums in Oxford and London because their genesis is very well documented, revealing close involvement in their conceptualisation and design by prominent scientists whose ideas can be recovered in detail. While there is a case to be made that both the Redpath Museum and the Royal Ontario Museum – known as the ROM – also perpetuate natural theology as a scientific worldview through their architecture, the record is far less complete. In each case we have at best half the story. The Redpath opened in 1882. It was built by McGill University in a Greek Revival style to house the collections of the university's principal and professor of geology, John William Dawson. Like Owen and Phillips, both of whom he looked up to (Dawson 1901: 153), Dawson was a forthright critic of Darwin's evolutionary theory. Throughout his career at McGill he wrote books which set out an uncompromising commitment to the prior theory of special creation and to the reconciliation of natural history with Bible study, from *Archaia: or, Studies of the Cosmogony and Natural History of the Hebrew Scriptures* (1860) through *The Origin of the World According to Revelation and Science* (1877) to *Modern Ideas of Evolution as Related to Revelation and Science* (1890), to name but a few. But while it is known that Dawson took an interest in the design of the Redpath Museum, the architects, Hutchison and Steele, were appointed by the benefactor, the sugar magnate Peter Redpath, not by Dawson (Liscombe 1988: 51), and it is not clear what role, if any, either of them played in the choice of the architectural style or the decorative schema. At the ROM, by contrast, the Romanesque architecture of the 1933 extension, built by Chapman and Oxley, appears to endorse natural theology directly through a quotation from the book of Job set into the Byzantine mosaic on the ceiling of its grand rotunda. This declares the intent 'That all men may know his work' (Job 37:7). But in this case there is little corroborative evidence that this worldview was endorsed by the museum's scientists.

Given these incomplete stories, how far is it tenable to see the architecture of either of these two Canadian museums as articulating their own versions of the natural theology affirmed by the two British ones? With the Redpath Museum, there is certainly a genealogical connection to the Oxford University Museum. In 1865 Dawson visited Oxford while in England for the British Association meeting. He wrote:

> we spent a most pleasant day with Phillips and his able colleagues, Dr. Acland and Professor Rolleston, at Oxford, in studying the admirable arrangements in the new museum and scientific library of that University, – institutions which are now, thanks to these eminent men and their colleagues, second to none in England, in facilities for the study of physical and natural science. In all that relates to the arrangement of specimens for study, and in affording due facilities to the student, Professor Phillips is as careful and enthusiastic as in his original investigations, and I can imagine no man better suited to cultivate scientific enthusiasm among students (Dawson 1901: 154).

Dawson revisited the museum in 1870, this time with Redpath (Dawson 1901: 156), who ten years later would endow McGill's new museum. From Dawson's memoirs, then, it is clear that the Oxford Museum, with Phillips as its keeper, was a significant influence on the founding of

the Redpath Museum and on his own curatorial practice and pedagogy. On the other hand, the architectural choices made at McGill, for all that their origins are obscure, seem to be diametrically opposed to those of Oxford. The choice of a Greek style has been tentatively traced by Rhodri Liscombe to 'the predominantly Greek style' of 'the major European museums' (1988: 53), being neither particularly characteristic of Hutchison's practice, which he described as 'a competent eclecticism' (51), nor of the McGill campus, which could be described in much the same terms. It allowed for the incorporation of some highly stylized foliate details, but nothing like the naturalism or comprehensiveness of the Oxford botanical capitals. Add to this the Enlightenment and even pagan associations of Greek architecture, and the Redpath Museum seems an unlikely expression of natural theology.

Yet if the Redpath does not express natural theology directly, its architecture must at least have been felt by Dawson to be compatible with it. The oval ceiling of the museum's main hall, ringed with daylight; the serene regularity and smooth rounded lines of the woodwork; the temple façade – these could all be seen to match a benign, orderly view of nature. Of course, this is little more than an impression. There is, however, one specific detail of the decoration that hints at Dawson's own contribution to natural history and his anti-evolutionary science. A frieze around the upper gallery incorporates what appear to be sea squirts or ascidians alongside highly stylized scallop or clam shells [fig 5].

Fig. 5: Frieze, Redpath Museum, Montreal. Author's photograph.

A clue to the potential significance of this seemingly insignificant if rather odd detail lies in the second of a series of lectures that Dawson gave in 1881, as the museum was being built. Dawson's object in these lectures was 'to point out the harmony which exists ... between what man can learn from the physical creation, and what has been revealed to him by the Spirit of God' (1882: 5-6). In the second lecture, Dawson launches a critique of the influential German evolutionist Ernst Haeckel, including rejecting Haeckel's claim that the juvenile form of the sea squirt reveals it to be intermediate between worms and vertebrates and so, as Dawson

fancifully puts it, 'enables us at once to recognize in the young ascidian an embryo man' (64). He returns to the same example later in the lecture, denying the plausibility that missing links might reveal an evolutionary chain by remarking 'In the phylogeny of man, for example, what a vast hiatus yawns between the ascidian and the lancelet, and another between the lancelet and the lamprey!' (81)

Eight years earlier, Dawson had rejected Darwin's proposal in *The Descent of Man* that the ancestral vertebrate must have resembled the larval form of the ascidian. For Dawson, this resemblance 'is merely analogical' and does not affect the ascidian's 'adult state or its real affinities with other mollusks' (1873: 338). The frieze around the interior of the Redpath Museum seems, subtly but steadily, to assert Dawson's insistent if misplaced faith that ascidians are simply 'mollusks of low grade' (1882: 62) and do not substantiate in any way the claims of evolutionists such as Darwin and Haeckel. As the balcony around the museum was initially used to display the collections of 'Zoology, Molluscae and Ornithology' (Liscombe 1988: 55), this architectural detail will have harmonized with and reinforced the message of Dawson's original display.

The decorative detail through which the Royal Ontario Museum proclaims its loyalty to natural theology is far less self-effacing. From 1933, the main entrance to the museum welcomed visitors into a rotunda with a golden mosaic arching across its ceiling [fig 6].

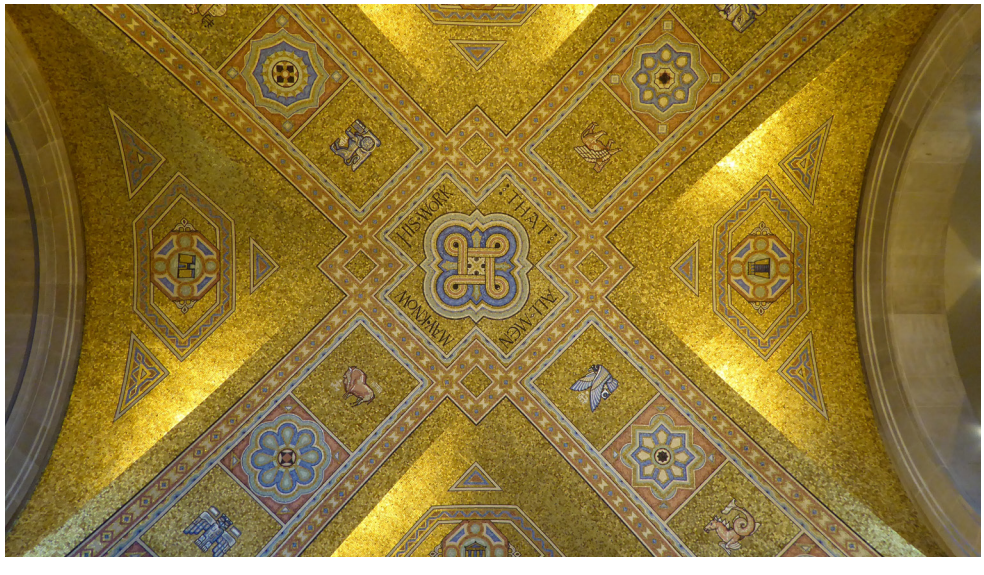


Fig. 6: Mosaic ceiling, atrium, Royal Ontario Museum, Toronto. Author's photograph.

The mosaic is crossed by two bands, containing four sets of three icons representing the cultural traditions of the Americas, Asia, and Classical and Christian Europe. The spandrels between the bands include images of four different kinds of ancient temple, while the square where the two bands cross contains the inscription from Job. As Kelvin Browne suggests, 'The theme of the dome could be one of unity in diversity; the glory of creation is manifest in many divergent ways' (2008: 101). If this is the theme, then the creation and its glory are explicitly attributed to a creator, and implicitly, through the geometrical arrangement that subordinates four pagan temples to the Biblical quotation, to the Judeo-Christian God.

It is possible to construct a narrative of the origins of the ROM and its architecture which would support this interpretation. David Livingstone has shown that prominent natural scientists in Victorian Toronto followed Dawson in resisting Darwinism (2014: 89-107). Charles Currelly, the scientist who led the campaign to found the museum in the early twentieth century, served as a Methodist missionary in Manitoba after studying natural science at the University of

Toronto and before returning there to read theology (Currelly 1976: 12-32). The building itself, like the Natural History Museum, is Romanesque, while the rotunda mosaic is inescapably reminiscent of St Mark's Cathedral in Venice. But this narrative is contrived and only works through omission. Robert Ramsay Wright, the professor of biology at the University of Toronto who helped to establish the museum, was a proponent, not an opponent, of Darwinian evolution (Livingstone 2014: 105-6; Teather 2005: 236), while his successor B. A. Bensley, who was the head of zoology within the ROM from its opening in 1914 to his death in 1934, did his PhD research at Columbia on marsupial evolution (Teather 2005: 236). Currelly was primarily an archaeologist, not a natural historian, and while he certainly took a lead in promoting and running the ROM, he was not responsible for its interpretations of natural history. Insofar as his 'biological training' shaped his own work, it was, by his own account, in that he 'always saw things in an evolutionary order, and wanted to see all the stages possible in a development' (1976: 246).

As with the Redpath Museum, it is hard to trace the direct influence of the scientists in charge of the ROM in its architecture. The choice of Romanesque forms inflected by Art Deco shaping and decorations for the 1933 extension to the building was largely determined by the fact that this was the style of the original 1914 building, which was in turn an example of a much wider fashion for Romanesque across the city. There are no specifically ecclesiastical echoes in the façade and, according to Browne, the decorative sculpture, designed by the sculptor Charles McKechnie, is in line with a contemporary programme to use 'contextually derived decoration as a way to create a Canadian style of architecture' (2008: 96). Given that the museum was also to be built of 'nothing but Ontario materials' as an act of regional regeneration during the Great Depression (Currelly 1976: 220), the dynamic here is not unlike that of the Trinity College Museum, where the architecture makes a confident bid for the value of local-come-provincial-come-national talent, style and materials. Furthermore, while the relief sculptures on the exterior walls include dinosaurs and the main entrance is flanked by the museum's dual motto 'The Record of Nature Through Countless Ages' and 'The Arts of Man Through All the Years', the 'contextually derived decoration' is dominated by the archaeological element within the ROM's wide brief, showing stylized images of human civilizations from across the globe. As the same is true of the mosaic above the rotunda, the quotation from Job appears to delegate God's work to 'Man', rather than to refer to Nature itself.

With both the Redpath Museum and the ROM, it is hard to make a sustained case that the architecture affirms any specific interpretation of science, let alone natural theology. That said, traces of this worldview remain in both buildings. At the Redpath, the ascidians in the frieze may be a modest but knowing allusion to Dawson's repeated assertion that, far from providing evidence for evolution, they weigh in the opposite side of the balance. Following this thread a little further, it is possible to imagine that the museum's architecture as a whole offered understated support for Dawson's natural theology by engendering a mood of serenity and a sense of quiet authority over nature. At the ROM, the quotation from Job on the ceiling of the rotunda is perhaps best understood as an artefact in its own right and with its own properties, one among many traditions of humanity's understanding of Nature and the Divine, like the signs of the zodiac that ring the arch above the main entrance or the stylized natural forms incorporated into the emblems of human civilization in the mosaic itself. Taken in its own moment, on the other hand, it would have seemed little more than a conventional piety, a remnant, rather than an affirmation, of the conception of science promoted, with different emphases, in Oxford and London.

Problem 3: The Plurality of Meaning

The six museums considered in detail above illustrate the plurality of possible meanings encoded in the architectural styles, plans and decorative schemas of museums of natural history. There is no clear correlation between particular styles or motifs and specific meanings. The same motifs may have different meanings in different museums, or indeed multiple meanings within the same museum. Through their global range and economic significance, the plants depicted on the ceiling of the Central Hall of the Natural History Museum in London speak of empire as much as botany (Knapp and Press 2005). The colonnade around the central court of the

Oxford museum was meant to teach geology, but as it uses exclusively British and Irish stones it has also been seen as 'demonstrating national pride in native resources' (Jovanović-Kruspel 2017: 83). Messaging may be overt and yet marginal to the museum's purposes, as in the case of the ROM's rotunda mosaic, or marginal yet in keeping with its founding principles, as in the ascidians at the Redpath Museum. Only rarely is it possible to reconstruct something resembling a comprehensive narrative and interpretation. Even then the comprehensiveness is always only provisional, pending new discoveries and changes in the lives of the buildings themselves, while the narrative cohesion is an artefact in its own right, much as it is with the interpretation of museum objects themselves.

One consistent challenge posed by natural history museums is the difficulty of establishing the extent and nature of the working relationship between the scientists and curators on the one hand and the architects and decorative artists on the other. At each of the Natural History Museum, Trinity College, the Redpath Museum and the ROM, a single scientist has taken a lead in the story. Of these, only Owen has left substantial evidence of active involvement in the design and decoration of the museum in question. Haughton, Dawson and Currelly most likely had only an incidental or peripheral influence on the architectural style and decoration of their museums, although of course an absence of evidence is not itself evidence of absence. Furthermore, none of these men, while they dominated their respective museums, can be presumed to have been the only scientists involved. It is generally accepted, albeit only on the basis of inference, that William Carruthers, Keeper of Botany at the British Museum, played a role in the designs for the ceiling of the Central Hall and the North Hall at the Natural History Museum (Knapp and Press 2005: 19, 52), while Tierney's recent research suggests that the botanist Allman may have had a more direct influence on the carvings at Trinity than Haughton. Remaining at Trinity, Humphrey Lloyd, the professor of natural philosophy, was on the committee overseeing the building of the museum (Cox 1993: 41), while James Apjohn, the professor of mineralogy, had joint responsibility with Haughton for running it (Wyse Jackson 1992: 266), yet to date nothing has come to light to suggest what influence either of them may have had on the design of the building itself. If Currelly had an influence, even indirectly, on the decorative schema at the ROM, then might Bensley have done so too, or W.A. Parks, the head of palaeontology? Through curating their own departments, they presumably at least shaped the architects' and McKecknie's sense of what decorations would be fitting for the museum.

The more complex and artistically rich the museum, the more the problem of the plurality of meaning intensifies. The Oxford University Museum's commitment to natural theology is revealed through its style and parts of its decorative schema, but it includes other views of science through the statues of scientists who form a pantheon around the central court and the O'Sheas' attentiveness to ecology in their carvings (Holmes 2018: 128-59). The museum's response to Darwin is complex too and hard to pin down. The few witnesses there are to it in the original decorations are comedic, like the puzzled monkeys in the next bay to the monkey puzzle tree on the east side of the central court and the grotesque carvings flanking one of the upper windows that recall Darwin's thought experiment in *On the Origin of Species* in which a black bear swimming with its mouth open to catch flies transforms over time into a creature 'as monstrous as a whale' (Darwin 2003: 210; see Holmes 2018: 144-47). The Oxford natural theologians themselves took different views on evolution, with Phillips and Daubeny largely sceptical while Acland was much more accommodating. Several of their later colleagues were enthusiastic Darwinians, including E. B. Poulton who sponsored a statue of Darwin to be added to the pantheon. Even accepting that there was broad agreement between the scientists involved in the initial project to build the museum, well over a dozen artists of one kind or another contributed to its decoration, each bringing his or her own views of nature and science to it, while the meanings of the building evolved as it acquired new features such as the statue of Darwin himself.

The same is true to perhaps an even greater extent of the Naturhistorisches Museum. Jovanović-Kruspel's comprehensive account of the Vienna museum's art and architecture closes with a set of 'Selected biographies' covering one scientist, two architects, four sculptors and eighteen painters (2017: 236-42). A close reading of her book as a whole shows that this list is indeed selective. She makes a compelling case that the decorative schema at the museum was shaped by the Darwinian sympathies of its first director, Ferdinand von Hochstetter, and

documents his practical involvement, including helping to select the scientists portrayed on the façade and providing photographs for the painters commissioned to depict particular landscapes. But she also offers glimpses of the input of other scientists who shared his view of nature, including Eduard Fenzl, the Director of the Royal Botanical Collection, and Franz von Hauer, who succeeded Hochstetter as Director when he died partway through the construction process. At the same time, while the idea of evolution runs through the museum's decoration, it manifests itself in different ways in different parts of the schema: sometimes explicitly and reverently, as in the inclusion of a bust of Darwin on the façade; sometimes explicitly but irreverently, as in the figures of a monkey and an ape taunting a cherub with a copy of *The Descent of Man* in the frieze around the interior of the upper dome; sometimes implicitly, as in the painting of *The Cycle of Life* by Hans Canon over the main staircase (see Jovanović-Kruspel 2017: 143-45); sometimes whimsically, if at all, through the many fanciful hybrid creatures included in the grotesque murals in the first-floor galleries. There are also large swathes of the decorative schema that do not prioritise evolution or have little or nothing to do with it.

The possibilities for interpretation at the Naturhistorisches Museum seem almost endless. If the Natural History Museum in London is the cathedral of science, the Naturhistorisches Museum is its palace. The pantheon of scientists is thoroughly international, yet the building as a whole is part of a complex created to honour the Hapsburg monarchy. The interior decoration sets realist landscape paintings alongside caryatids which in turn range from the ideal to the grotesque, personifying minerals, grappling with extinct animals or typifying different ethnic groups. The exterior sculpture combines personifications of ideas and places with classical and Judaeo-Christian myths and statues of scientists and explorers, at least one of whom, Jason, is himself mythic. The whole building is literally wonderful, a fantasia of science and nature.

These same tensions between national prestige and universal truth, between symbolic and realistic modes of representation, between science as fact and science as myth, are played out once more in the architecture of the anatomy and palaeontology galleries of the Muséum national d'Histoire naturelle, opened in the Jardin des Plantes in Paris in 1898. As at Oxford and in Vienna, the schema combines natural history with allegory and portraiture, in this case to represent something that looks like a Darwinian vision of nature, shot through with violence as sculptures show animals goring and mauling one another [fig 7] and men grappling heroically with bears, eagles, horses and crocodiles or being throttled by an orang-utan.

Fig. 7: Relief sculpture, Galeries d'Anatomie comparée et de Paléontologie, Paris. Author's photograph.

Yet, unlike in Vienna and even, eventually, Oxford, where he has an assured place in the pantheon, in Paris Darwin is nowhere to be seen. Instead, the busts that look out from in front of the museum's windows are strictly French, the doyens of Parisian natural history, some evolutionist, some not, but none an obvious spokesman for Darwinism. Given the scepticism towards Darwin within French science in the late nineteenth century, this is unsurprising, except for the incessant emphasis in the rest of the decorative schema on the struggle to survive and on humanity's own place in that struggle.

In this article I have cast the questions that arise from the plurality of meaning built into the architecture of nineteenth- and early twentieth-century natural history museums as a set of problems. But they are equally an invitation and a license to explore every detail of these buildings and to reconstruct their meanings. In examining these questions we have seen that individual buildings that we tend now to think of as natural history museums may have different origins and complementary purposes, and that these are reflected in the complex properties of their spaces and of the fabric and style of their construction. In all the cases we have looked at, the decorative arts have been crucial to the building's meanings, yet the messages they communicate are not always what they seem. Sometimes decorations take on new meanings, like the images of Canadian natural history that match so well the remit of the Canadian Museum of Nature for all that they were made for a national museum with a different brief. Sometimes meanings can be so precarious as to be easily lost, like the rebuttal of evolution encoded in the ascidians in the bannister around the top floor of the Redpath Museum. Sometimes, as in Vienna, there are so many meanings that we can only hope to recover or reimagine a selection of them as we put them into dialogue with one another. By learning to read the stories that natural history museum decorations tell about science we can enhance our understanding, not only of the museums themselves, but of the history of science and its relationship to art. But no less meaningful are the stories these buildings tell that are not about science at all, or that may be, in ways that are suggestive and enticing but not, or not yet, resolvable. Above all, what these problems of interpretation reveal are the processes involved in reading the properties of museum architecture, testing the impressions that buildings form against their origins and situations where we can, speculating with care when we cannot, and recognising that, while a building may not mean what we want it to, the meanings that it does yield are equally if not more revealing when they compel us to reassess our expectations.

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Notes

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[2] The websites of these museums include images of the museums and information concerning their history and their architecture. Here are links to each of them in turn: the Oxford University Museum of Natural History (https://www.oumnh.ox.ac.uk/about); the Natural History Museum (https://www.nhm.ac.uk/about-us/history-and-architecture.html); the Trinity College Dublin Museum (https://www.tcd.ie/Geology/about/museum.php); the Canadian Museum of Nature (https://nature.ca/en/about-us/history-buildings); the Redpath Museum (https://www.mcgill.ca/redpath/about/history); the Royal Ontario Museum (https://www.rom.on.ca/en/about-us/rom); the Naturhistorisches Museum (https://www.nhm-wien.ac.at/en/

museum/history__architecture); and the Galerie de Paléontologie et d'Anatomie comparée at the Muséum national d'Histoire naturelle (https://www.mnhn.fr/en/visit/lieux/galerie-paleontologie-anatomie-comparee-paleontology-and-comparative-anatomy-gallery).

3 The scholarship on these two museums is particularly extensive. For previous discussions of how they represent scientific ideas, see Bullen 2006; Cunningham 2001; Gilbert 2009; Girouard 1999; Holmes 2018: 117-59, 207-33; Rosenfeld 1999: 238-305; Van Eck 1994: 203-12; and Yanni 2005: 62-90, 111-46. For comprehensive histories of the architectural practices that built them, see Blau 1982; Cunningham and Waterhouse 1992; and O'Dwyer 1997.

4 Canadian Museum of Nature: Historical Timeline. https://nature.ca/en/about-us/history-buildings/historical-timeline, accessed 7 June 2019.

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