Chapter 19

The Exhibition of Extinct Species

A Critique

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Introduction

Museums and galleries are the places to go if you want to see extinct species. After all, you cannot find any of these intrinsically interesting animals, plants, fungi or protists in zoos, national parks or wildlife refuges, much less in your backyard or local woods. Naturally, you can also meet extinct species on television, radio and the internet, in the movies, in video games and increasingly in theatres via the magic of animatronics, not to mention in books and magazines. But the sense of awe most people get from being in the physical presence of an accurate portrayal of even the humblest extinct species is an aesthetic experience that is often carried in memory for the remainder of their lives.

The relation between extinct species and a wide range of contemporary cultural, socio-economic, political, historical and scientific issues places a considerable burden on museums and galleries to tell their stories in a way that that deals with these complexities and remains truthful to the biological facts. Sadly, most museum exhibitions stick strictly to the latter two of these factors, perhaps with a knee-jerk tug at the emotional heartstrings as a consequence of extinct species' fates. The extent to which these institutions have been willing to meet the challenges that a genuine understanding of extinct species' stories requires, provides an insight into the expectations they have of themselves and of their audiences, in whose hands the fates of living species ultimately reside. Moreover, as all large national museums and galleries, as well as many regional and local institutions, receive all or part of their funding from public sources, the manner in which these institutions decide how to handle controversial subjects, such as extinction, provides insight into the power relations that exist in all human societies.

A Brief History of Extinction

An appreciation that species can become extinct is a surprisingly recent scientific development in Western culture. From the time of Aristotle (ca. 350 BC) to the early 1800s, the very idea of extinction was dismissed out-of-hand by most scholars. Historically, fossils recognizable as vertebrate and common invertebrate animals or plants were regarded as evidence for mythological creatures,[1] extant species or 'sports of nature'. Even the well-documented extinction of the Mauritius Dodo[2] was rejected as evidence for extinction initially, owing both to the rarity of specimens and the often fanciful nature of eyewitness descriptions. The Dodo's current status as a global extinction icon was not gained until well into the nineteenth century, over a hundred years after it had become extinct.

Acceptance of extinction as a fact came about, in part, because of a French insult to the New World, and the response by an entrepreneurial nineteenth-century American painter. In the run up to the French and Indian War (1754–63), French soldiers collected the teeth and the femur of a large unknown animal that were exposed at a locality in the territory of Ohio, referred to as Big Bone Lick, which was well known to local Indians. These specimens were sent to Paris in 1762 and entered into the collections of the Cabinet du Roi, where the femur was identified as belonging to a 'Siberian mammoth' and the teeth to a hippopotamus by Louis Jean-Marie Daubenton, then a museum curator working under the direction of Georges-Louis Leclerc, Comte de Buffon. Buffon was prominent in European biological circles for advocating the theory of racial degeneration. This theory included his 1789 proposition that, because of their 'smaller, weaker and generally inferior character', New World quadrupeds should be regarded as degenerate forms of European ancestors.[3] Many New World intellectuals considered this a thinly veiled political slur, including one Thomas Jefferson. Natural history was prominent among Jefferson's many interests and he set about collecting specimens, stories, anecdotes, myths and legends that would prove Buffon wrong; hence his interest in fossilized specimens of what the French called the *animal de l'Ohio*, but which Americans had dubbed the *American Incognitum*.

By the late 1700s, *American Incognitum* fossils were turning up fairly regularly in the Quaternary terrace deposits along the continent's eastern seaboard, including, in 1801, a spectacular find of what appeared to be an articulated specimen in a quarry near Newberg, New York. When the noted American portrait painter Charles Wilson Peale learned of this discovery, he rushed to Newburg, inspected the site, bought the bones that had been recovered thus far, and acquired the right to make further excavations from the landowner. Peale understood the symbolism this animal had acquired in the (now) United States, and had a hunch it might serve as a compelling centrepiece attraction in his new Philadelphia museum, which he had created to display his own portraits and natural history collections.[4]

Previously, Peale had painted Jefferson's portrait while the latter was the US Secretary of State. Jefferson was aware of Peale's interest in the *American Incognitum* and encouraged his efforts. With the help of the anatomist Caspar Wister, Peale mounted the full *American Incognitum* skeleton, substituting plaster casts for the missing or broken bones. The mount went on display in Peale's museum in 1801, with the tusks curving downwards (incorrectly) in order to increase the perception that this was a ferocious American monster.

Jefferson held out hope that populations of the *American Incognitum* would be found in the interior of North America, a substantial tract of which he acquired from Napoleon in 1803 as the Louisiana Purchase. Quickly thereafter, Jefferson funded the Lewis and Clark expedition (1804–6), primarily to explore the new territory but also to find a practical route for access to the continent's western coast. However, as documented in an 1803 letter to Meriwether Lewis, Jefferson also wanted the party to survey the territory's economic and resource potential. In particular, he charged Lewis to be on the lookout for 'the animals of the country generally, and especially those not known in the U.S., the remains and accounts of any which may be deemed rare or extinct'.[5]

Lewis and Clark did not find the *American Incognitum*, and Jefferson eventually reconciled himself to its absence from the North American landscape. Meanwhile, in Paris, a young Georges Cuvier was applying his newly developed principles of comparative anatomy to the *animal de l'Ohio* and similar fossils collected from the Paris Basin, all of which now resided in Paris's Musée national d'Histoire naturelle. Upon close inspection, Cuvier concluded that: (1) both the femur and the teeth of *animal de l'Ohio* came from the same animal; (2) neither the African elephant nor the Indian elephant bore close morphological similarities to the unknown bones; and (3) neither did the bones of the Siberian Mammoth (which itself eventually came to be identified as an extinct species).[6] Reasoning that it was unlikely such a large animal could have gone unnoticed by previous explorers, Curvier concluded the animal, which he named a *Mastodon* in recognition of the conical character of its molar cusps, was most likely an extinct species of elephant.[7] Although Cuvier spent much of his remaining career convincing sceptics that extinction was a real phenomenon, such was his standing in the biological community that an increasing number of anatomists accepted his pronouncement on the reality of extinction.

And what of Peale's *American Incognitum* mount? Its popularity with the citizens of Philadelphia knew no bounds. Indeed, Peale's mount, in conjunction with Cuvier's identification and interpretation of the *Mastodon*, set the template that has been followed by museum and gallery exhibitions of extinct species ever since, especially once the bones of that other extinct group, dinosaurs, came to be recognized for what they were – the true extinct monsters that Jefferson had hoped for, and Peale had pretended, the *American Incognitum* to be. All depictions of extinct monsters in museums and all media, from the Crystal Palace dinosaur sculptures (1851) to *Jurassic World: Extinction* (2021), can be traced to Peale's excavation and reconstructed mount of the *American Incognitum*.

A Brief History of Natural History Museums and Galleries

In order to understand how museum and galley exhibitions of extinct species function, and the challenges these institutions face in taking a broader view of the extinction issue, an understanding of the history of these institutions is necessary, especially regarding the radical change in their purpose since their inception. A museum is any institution that houses, cares for and exhibits objects of cultural, artistic, historical and/or scientific importance. Museums originated as collections of objects made (usually) by wealthy or important men as part of their work (e.g. collections of medicinal plants), for aesthetic reasons (e.g. collections of pictures and sculpture), or by virtue of their positions in society (e.g. collections of gifts presented to heads of state). In a more general sense though, museums grew out of a deep human need to collect information and organize it into ordered categories.

While private collections had been made and exhibited by a variety of individuals as far back as Neo-Babylonian times (c. 530 BC), most historians trace the origin of modern museums and galleries to western Europe, specifically the opening of Oxford University's Ashmolean Museum in 1683. The Ashmolean's collection was based on the private collection of Elias Ashmole, which was composed of coins and engravings as well as geological and zoological specimens, including a taxidermy mount of the last Dodo seen alive in Europe, all housed in a purpose-designed museum building.[8] The first public museum was the Louvre, which opened a little over a century later, in 1793. Although the heyday of museum building in western Europe and the United States was the Victorian age (1837–1901), the concept and organization of Victorian museums was illustrated pictorially by Charles Wilson Peale's 1822 self-portrait, *The Artist in His Museum* (Illustration 19.1).

In this painting, we see Peale holding up a curtain in the manner of the impresario he was, beckoning the viewer into his museum where the

Illustration 19.1 Charles Wilson Peale, *The Artist in His Museum*, 1822. Note a few bones of the *American Incognitum* in the foreground, and the basal parts of the mounted skeleton behind the raised curtain.

specimens have been organized and arranged to tell a story without the need for verbose or complicated labels. Museum historians refer to this design concept as 'object-based epistemology'.[9] As the viewer moved laterally through the exhibit, the specimens changed in a consistent and obvious way (e.g. the zoological transition from sponges to arthropods, or fish to mammals), while, as the viewer's gaze moved up from the lower cases, another dimension of organization was apparent (e.g. simple to highly ornamented, herbivores to carnivores, local species to species from remote regions). In the context of this exhibition-design aesthetic, the specimens are not just the primary focus of the exhibition; they are its only focus. Every aspect of the exhibition's design, and even the gallery design (e.g. large skylights to let natural light in) was present to direct the viewer's gaze to the specimens or objects on display. Furthermore, it was no coincidence that Peale's own portraits of famous and important Americans were placed above the display cabinets. Such placement reinforced the idea that humans (including, in Peale's case, some females) occupied the apex of the natural order, and that the apex of humanity was embodied by rich and noteworthy individuals. Thus, in Victorian museum exhibitions, specimens functioned both as synecdoches and metonyms.

The larger purpose of these institutions was to provide instruction to the general public; but not only in terms of the objects on display. Museums and galleries were also charged with providing, via the examples set by their staff and patrons, standards of the appropriate dress, manners, attitudes and behaviours expected in polite society. In an era before mass entertainment, and when the cities in which most Victorian museums resided played host to an increasingly polyglot population, museum displays were considered one of the most effective means of communicating with the 'common man'. Victorian museums celebrated the accomplishments of the society in which they were embedded, educating the public about those accomplishments, and engaging their visitors in 'civilizing rituals'.[10] At an even more abstract level, Victorian museums were about order, promoting the knowledge that comes about through the understanding of order and, more subtly, emphasizing the importance of preserving the 'natural order' – both scientific and social – if the fruits of human knowledge were to be recognized and developed.

These functions continue to lie at the heart of most museum and gallery exhibitions, and that of the museum/gallery experience in general. Indeed, in our modern, and increasingly postmodern world, when all forms of tradition, authority and order are subject to critical scrutiny, the obsession of museum exhibitions with the promotion of a static order often evokes the sense of tension that arises when one is being subjected to unwanted indoctrination. Indeed, to the casual, modern museum goer, the sight of an old-fashioned Victorian museum gallery – with its long banks of glass cases containing sparsely labelled specimens – is perhaps more likely to elicit a sense of panic rather than pleasure.

Along with their cultural and educational roles, Victorian museums served another, lesser-appreciated purpose; they were centres of intellectual debate and scientific research. This might seem odd to the contemporary reader, for in today's world it seems self-evident that these roles are located primarily in the great research universities. But such was not always the case.

The heroic era of museum and gallery building coincided with a time when natural history specimens, art works, artefacts, manuscripts, and curios of all types were pouring into the urban centres of western Europe and North America owing to the exploration and economic activity that resulted from the Industrial Revolution (c. 1760–1840). In no small measure, the great Victorian museums and galleries were founded in an attempt to deal with these new objects and the new ideas they inspired. Accordingly, a major intellectual challenge of the time involved the cataloguing of these materials, and their placement within a relational classification system that facilitated the identification and/or prediction of properties that could be useful in economic and scientific contexts. Victorian museums and galleries were the institutional foci of this task, which was promoted to the public at large through their exhibitions, lectures, and educational programmes.

Critics who adhere to the views of philosophers such as Marx and Foucault often criticize both Victorian and modern museums for their tendency to use their exhibitions to promote arbitrary and socio-economically selective classification systems aligned with the interests of the wealthy, powerful, and well-educated elite, rather than those of the masses. Indeed, under the rubric of the 'treasure house' (a typical metaphor), museums and galleries can be seen as little more than overbearing signifiers of irresponsible power, in that they both display and legitimate the immoral – and often illegal – expropriation of resources, art works and artefacts from other cultures. While it is certainly the case that all human-devised classification systems are arbitrary, and that almost all of the major museums and galleries include questionably procured specimens, what these critics often overlook is that classification systems are the conduit through which knowledge of the world is gained.[11] Humans have collected specimens and objects of interest and placed them into collections throughout the history of our species, and will continue to do so. When humans went to the Moon, and when they go to Mars, one of the primary purposes of those trips was (and will be) to make collections of the materials they find there. Museums are the places where large collections of such objects are housed and made available for the purposes of education, research and entertainment. The intellectual challenge for museums and galleries, especially in the context of biodiversity conservation and the issue of extinction, is not whether such collections can be used to further the ends of society through their exhibition, but what the ends to which these collections might contribute will, or should, be.

Universities, rather than museums, are now universally regarded as the natural home for high-level education and advanced intellectual inquiry. This change came about around the end of the nineteenth century, when simple documentation and classification were replaced by direct experimentation as a way of gaining knowledge. In science, the intellectual interest in natural objects was replaced by an interest in natural processes, whose investigation did not require access to large collections. Since that time, and with ever-increasing frequency, museum research programmes have been curtailed because museum operating budgets have had to rely on uncertain quantities of public money, either in terms of direct funding for national museums or state/city grants for regional and local museums, augmented by charges levied on visitors, and pleas for donations directed towards the public. As a result, few museums can compete with large research universities in terms of securing the instruments or infrastructure needed for engaging in contemporary scientific research or art collection from their own budgets. A secondary effect of this diminution of institutional expertise has been an increasing trend towards using museums and galleries as destinations for grade-school field trips, when very rudimentary lessons about science, history and culture are taught. The relegation of many once important and proud institutions to the status of 'children's museums' has had a devastating impact on many aspects of museum/gallery culture. Art galleries have managed to escape this cruel fate to a much greater extent than museums insofar as they are patronized/supported by adult members of their communities for their own edification and pleasure.

Extinct and Near-Extinct Species

Darwin's materialist theory of evolution precipitated a scientific and cultural revolution with regard to ideas about how species – including our own – originated, but was surprisingly terse in its treatment of extinction. Darwin accepted that extinct species existed but, aside from regarding extinction as the ultimate consequence of the 'struggle for existence', assigned it little creative role. We now know that extinction plays a major role in promoting biodiversity at all levels by triggering profound changes in extant selective regimes that can abolish the advantages of ecological incumbency (Figure 19.1). Thus, mammals that appeared in the late

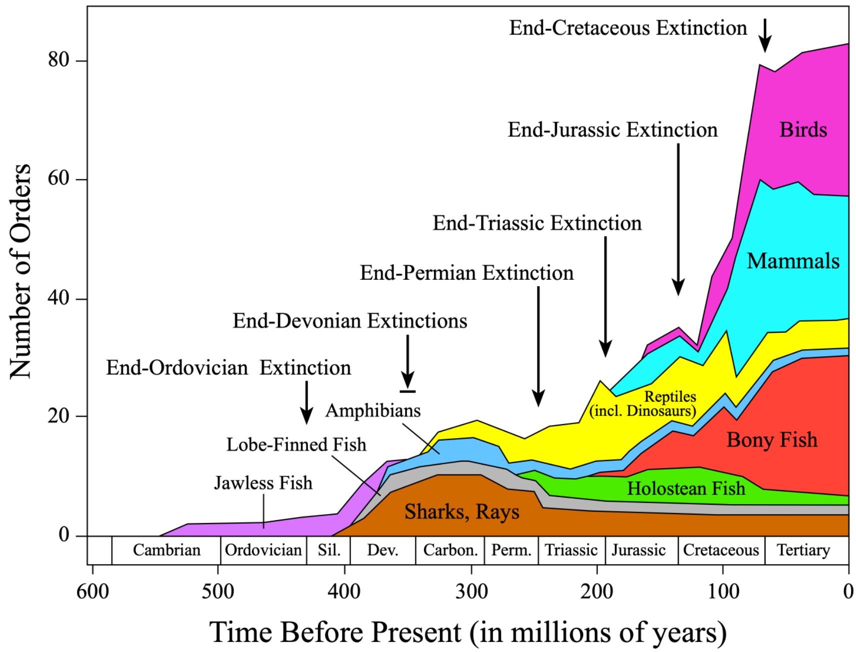

Figure 19.1 Diversity history of the major vertebrate orders. Note how vertebrate diversity has accumulated through time, despite the Earth having suffered major extinction events, as well as the association between the appearance of new orders and the global extinction events that reset selection regimes. © Norman MacLeod.

Triassic Period (c. 200 million years ago), somewhat later than, but about the same time as dinosaurs, were excluded from many ecological roles in the terrestrial landscapes they inhabited because dinosaurs had diversified into those roles first. This situation was reset some 175 million years later by the end-Cretaceous extinction event. The reorganization of local and, in the case of large extinction events, global biotas as a result of extinction events, promotes biodiversity due to evolutionary stacking, as it is rare for all representatives of formerly diverse groups to disappear entirely, even during major extinction intervals. In this way, previous extinction events in Earth's history – especially the so-called mass extinction events – are, in part, responsible for the wonderfully diverse biota we see today, and whose susceptibility to future climate change is a matter of concern to us all.

Ancient Extinctions

The modern scientific interest in extinction research dates from the 1950 publication of Otto Schindewolf's *Grundfragen der Palaontologie* (Handbook of Palaeontology).[12] Schindewolf was an iconoclast among twentiethcentury palaeontologists for his rejection of Darwinian natural selection as the primary driver of evolutionary change, his advocacy of directionism and periodicity in earth history, and his catastrophist theory that mass extinctions had taken place in the Earth's geological past driven by radiation from a nearby supernova. All these ideas have been repudiated by subsequent scientific research, except Schindewolf's general concept of mass extinction. Taken up and given fresh empirical support by Norman Newell,[13] and later by David Raup and John J. (Jack) Sepkoski Jr.,[14] the long-suspected idea that very large extinction events had occurred repeatedly in what has come to be called 'Deep Time' had, by the mid-1980s, been established beyond reasonable doubt, though much debate continues regarding these events' cause(s). Early in this process, Raup and Sepkoski developed a quasi-objective statistical test for identifying truly large geological extinction events, and settled on five intervals of earth history they regarded as being characterized by extraordinarily large, or 'mass', extinctions. It is these five events that are referred to as the 'Big Five' mass extinctions of the geological record, with the modern biodiversity crisis often being referred to as an incipient 'sixth'.

Owing to the number of palaeontological species and the difficulty of placing them accurately into a classification system based on modern organisms, most deep-time surveys of biodiversity and extinction employ taxonomic categories higher than that of the species – usually taxonomic families or genera. This makes estimating the true magnitude of geological extinction events, as well as comparison with data from modern species, difficult, because there is no way to tell whether a taxonomic family or genus is represented by only a single surviving species or by several hundred. David Raup addressed this problem in 1979 using a statistical method termed 'rarefaction' to model the relation between percentage family loss and percentage species loss, under the assumption that species were being eliminated in a random manner. The relation between species-level losses and the losses at higher taxonomic levels can be simulated mathematically, and the results of such simulations expressed graphically in the form of what Raup termed a 'kill curve'. Using such kill curves, anyone can transform an empirically validated number of family- or genus-level extinctions into an estimated number of species-level extinctions.

Raup undertook this exercise as a way of estimating the probable species-level loss for the end-Permian extinction event from family-level data.[15] The result astounded everyone. Based on an approximately 20 per cent loss of marine invertebrate families during the last 8 million years of the Permian Period, Raup estimated the level of species loss could range from a low of 76 per cent to a peak of 96 per cent. By 1979, most geologists knew the end-Permian extinction event was the largest in recorded geological history, but few imagined the loss could have been as great as

96 per cent of all fossilizable life in the oceans. Subsequently, Raup and others have calculated the probable species loss inferred from both family- and genus-level counts for the other 'mass' extinction events in Earth's history (Table 19.1). These estimates provide a sobering benchmark against which to appreciate the level of loss the earth's biota has experienced in the geological past, as well as the magnitude of loss it takes to qualify as a true 'mass extinction'.

Single extinction events tend to be the sole research focus of individual researchers and/or teams. Little direct research has been done on multiple events using the same approaches. Many physical mechanisms have been proposed by palaeontologists and others as having caused each of the geological mass extinction events, some serious (e.g. climate change) others fanciful (e.g. mass psychosis in dinosaurs).[16] Among the most consistently proposed causes are sea-level change, climate change, volcanism, marine anoxia, and asteroid/comet impact. Each mechanism has supporters who advocate it as the sole cause of particular extinction events, while others believe the mass extinctions occurred when the operation of various major environmental disruptor mechanisms coincided in time. No single mechanism is accepted as having been the cause of all mass extinction events.

Modern Extinctions

The most respected multi-group source of information on recently extinct and endangered species is the International Union for the Conservation of Nature (IUCN), which maintains and publishes annual updates to its Red List of Threatened Species.[17] Table 19.2 summarizes the most recent (2021) IUCN data for twelve major organismal groups showing percentages of species considered at low risk of extinction, vulnerable, endangered

Table 19.1 Estimates of species-level extinction loss from genus-level palaeontological data, using Raup's kill-curve approach. These results assume equal genus sizes and equal species-specific extinction probabilities. Data from Jablonski, *Extinctions in the Fossil Record*, 18.

Extinction	Age (million years ago)	Est. Percentage Genus Loss	Est. Percentage Species Loss
End-Ordovician	439	60 ± 4.4	85 ± 3.0
End-Devonian	367	52 ± 3.3	83 ± 4.0
End-Permian	245	69 ± 3.8	95 ± 2.0
End-Jurassic	208	60 ± 4.4	80 ± 4.0
End-Cretaceous	65	47 ± 4.1	76 ± 5.0

Table 19.2 Current (2021) estimates of all extinctions of modern species, tabulated by the IUCN from both contemporary and historical data, along with estimates of species numbers in various endangered, vulnerable and low-risk categories. Note that coverage is only adequate for a small proportion of low-diversity, charismatic groups.

	Extinct		Endangered		Vulnerable		Low Risk			
Taxonomic Groups	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**Total Evaluated**	**Est. Total**
Mammals	115	1.93	772	12.97	555	9.32	3,324	55.83	5,954	5,954
Birds (Aves)	186	1.67	683	6.12	798	7.15	8,460	75.82	11,158	11,158
Reptiles	78	0.85	1,026	11.24	561	6.14	5,715	62.58	9,132	10,700
Amphibians	184	2.55	1,723	23.88	721	9.99	3,129	43.37	7,215	8,500
Sharks/Rays	3	0.25	213	17.42	180	14.72	534	43.66	1,223	1,300
Bony Fish	217	1.03	1,626	7.74	1,241	5.91	13,064	62.19	21,006	35,000
Echinoderms	–	–	8	2.14	9	2.41	111	29.76	373	7,000
Insects	141	1.23	1,109	9.66	850	7.40	5,841	50.88	11,480	900,000
Non-insect Arthropods	70	1.87	558	14.94	420	11.25	1,344	35.99	3,734	270,000
Molluscs	464	5.19	1,297	14.52	1,042	11.67	3,331	37.29	8,932	50,000
Corals	1	0.12	32	3.69	234	26.96	293	33.76	868	9,000
Plants	718	1.28	13,828	24.59	8,675	8.39	25,676	45.65	56,245	391,000
Total	2,177	1.59	22,875	16.66	15,286	11.13	70,822	51.57	137,320	1,699,612

or extinct. These data are based on evaluations of over 1 million species against a consistent set of well-defined criteria. As can be seen from the table, while some groups (e.g. mammals, birds) command so much attention from conservationists that, essentially, all species are being monitored, in most cases (e.g. insects, molluscs, arthropods, echinoderms) only very modest efforts are being made to monitor their extinction states. Thus, for many groups, current assessments of extinction risk may not be accurate.

Setting these caveats aside, as these are the best data available at the moment, on a percentage basis the total number of species known to have become extinct, either globally or just in the wild, over historical times is surprisingly small. It is also largely confined to groups associated with ecologically precarious habitats (e.g. birds endemic to islands). Of course, the elimination of any species by causes that can only be deemed as 'non-natural' must be lamented. Moreover, some groups have obviously suffered more extinctions to date than others. But in terms of the proportions of species scientific experts recognize as being lost, the biosphere is currently well below anything that could conceivably be considered a 'mass extinction' (see the prehistoric 'mass extinctions' detailed in Table 19.1).

Concern over modern extinctions within the scientific community comes not so much from the number of species that have become extinct to date, but rather the proportion of species considered endangered and vulnerable, and the rate at which species are moving from the 'low risk' to higher risk categories. The IUCN believes that, if habitat loss, invasive species, pollution, human population, and over-harvesting (HIPPO) trends continue, all species currently considered endangered will become extinct within the next one hundred years. This estimate is controversial. Some specialists consider it far too low, others far too high. Regardless, these data confirm that a substantial proportion of the known biosphere is currently at risk of extinction.

The need for species conservation strategies to be developed and implemented is obvious. The need to inform the public about these issues in a manner they understand is clear. Fortunately, one hundred years is a long time in terms of scientific understanding, technological innovation and public policy. One hundred years ago the dangers of HIPPO practices, and the threat they posed to the biosphere, were appreciated by a vanishingly small number of naturalists and researchers. More generally, few of the predictions made in 1920 about the world of 2020 have come true. This observation is not made to induce any sense of complacency, but rather to give the reader hope that, with goodwill and hard work, there is time to address the extinction issue and avert the future to which the IUCNs data point. Good scientific evidence indicates the predictions of the IUCN, and those of many other conservation organizations, will certainly come to pass if political establishments, regulatory bodies, corporations, and/or the general public worldwide do nothing. But given the high public profile that ecologically sustainable styles of living, working and voting have achieved in just a few decades, it seems unlikely nothing will be done to address this problem and save threatened species. The need, of course, is to educate the public and assist them in mobilizing effective responses to this challenge. This is the area where museums and galleries can, if they choose, make a substantial contribution to species-conservation efforts and, in so doing, reaffirm the purpose for which they were founded originally.

What Stories Should Museums and Galleries Tell?

The challenge that museums and galleries face when mounting extinct species exhibitions is to do justice not only to the best scientific information, but also the associated economic, social, cultural and historical information about this complex subject, and present it in a way that both attracts and informs visitors. Labelling extinction as a scientific or technological problem is insufficient. Extinction is a social and cultural problem.[18] In this context, the level of public understanding of the extinction issue is quite low, and so the potential for visitors coming away better informed is high. But this advantage is offset by the public's generally negative attitude towards the subject. While there is vast popular interest in charismatic endangered species (e.g. felids, proboscideans, raptors), extinction is seen fundamentally as both evidence of, and a metaphor for, failure; failure on the part of extinct species for not winning their struggle for survival, and failure on the part of humanity for thoughtlessly usurping resources on which extant species depend. To take an obvious example, the novel and little-understood creative role extinction has played in promoting biodiversity is almost always ignored in exhibitions in favour of the awkwardness and guilt evoked by popular perceptions surrounding the topic. Indeed, the general lack of informed discussion and education about the extinction issue in such broader contexts harms the entire contemporary conservation movement. But this need not exhaust the range of expectations for such exhibitions, especially among more mature and/or thoughtful audiences.

Owing to its inherent complexity, the extinction issue should always be presented via reference to multiple levels of historio-conceptual understanding, and involve multiple disciplines/interests. Like the magazine articles, books, television documentaries, and videos/movies from which they take their inspiration, museum and gallery treatments of the extinction issue must transcend the tragic and elegiac expository mode, which, in lamenting the passing of selected charismatic species, implicitly casts the finger of accusation back at the exhibition visitor. Justification for this approach is usually made via reference to 'scientific' evidence, as if science is the only source of authoritative evidence, exists in a cultural vacuum, and is in complete agreement with itself. In some instances, such exhibitions have even included trivializations of the subject in the form of extinction-themed video games,[19] thus further complicating the signals being sent. Since this approach has singularly failed to provide a unified, compelling vision of how to address the current crisis – other than to subordinate all social, cultural, economic and political decisions to a vaguely described, authoritarian, environmental 'agenda' – it is little wonder that such increasingly strident exhortations have had the opposite of their intended effect.

In fact, each of the assertions that underpin this approach to extinction exhibitions are deeply flawed. For example, there is no known habitat that has been occupied continuously by humans that has not undergone extensive change and active management throughout the period of that occupation. Thus, the appeal to a time when humans lived in a supposedly 'harmonious' state of nature is largely fictitious.[20] While there is no question that many modern species are in decline, we actually live in an era of biodiversity *increase* owing to the ongoing discovery of new species, the migration of modern species to new habitats,[21] and the evolution of new species adapted to urban environments.[22] The science of extinction is shot through with intriguing complexities and uncertainties.[23] Moreover, the idea that scientists can, much less do, operate in a cultural or political vacuum has been thoroughly debunked.[24] Of late, some conservationists have even begun to challenge the very idea that 'nature', in the a sense of a place separate from the dominant influence of mankind, exists. To the extent this is true – and it certainly is true for many parts of the world – the pertinent issue is not how nature can be returned to a 'natural' state, but rather how 'natural environments' can be managed to meet the needs of both human and non-human species.

This more inclusive view of the extinction issue is beginning to cause an interesting reconsideration of the extinction issue's nature. In addition to widening the scope for discussion, this reconsideration widens the scope for productive and affirmative institutional engagement with a wide variety of local and remote communities.[25] I suspect museums will have considerable difficulty coping with this new approach, tied, as they are, to the concept of their primary purpose being the advocation of order and education of children. Art galleries, however, are much more used to engaging audiences over a wider range of approaches, and are much more comfortable with the idea of their exhibitions appealing to diverse audiences through thoughtful inspiration rather than pedagogic instruction.

One easy lesson that museums could take from galleries is to incorporate a focus on the professional and social lives of the scientists who made the discoveries and found the specimens on display into their traditional focus on the specimens and artefacts themselves. Art gallery exhibitions typically contain precious little information about the techniques of painting and sculpting or theory of perspective, but always include much information about the lives of the artists themselves and the effect their work has had on the lives of other people. The lives of many scientists are no less eventful and interesting, and the mystery of the creative process is largely the same in both groups.

Take, for example, the complex of social factors that influenced relations between two lions of Victorian natural history, Sir Richard Owen and Thomas Henry Huxley (Illustration 19.2). Both had similar middle-class origins, though Huxley's childhood was blighted by family financial misfortunes. Owen enjoyed the benefits of a formal secondary-school education whereas Huxley managed only two years of primary school. Although neither held a university degree, both managed to master their topics more or less through self-education. By dint of his undeniable talent and hard work, Owen, the older of the two, quickly rose through the ranks of Victorian science, developing, along the way, a secondary talent for cultivating influential patrons. Huxley, on the other hand, had a much more difficult early career. After returning from his reputation-making voyage as the surgeon and marine naturalist on board HMS Rattlesnake, Huxley was

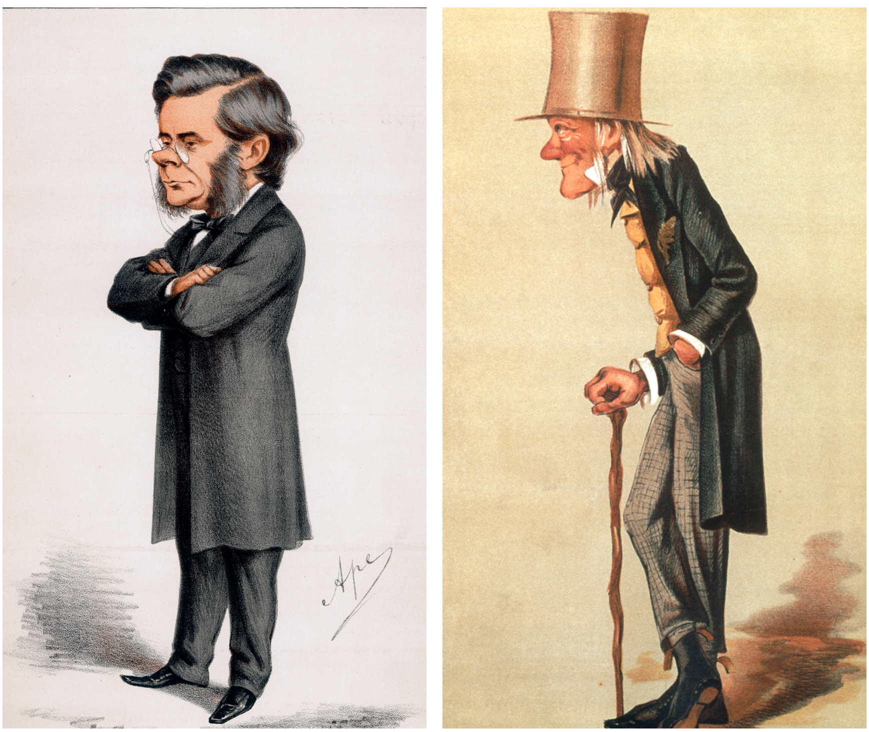

Illustration 19.2 Carlo Pelegrini's caricatures of Sir Richard Owen (left) and Thomas H. Huxley (right) for *Vanity Fair*, c. 1870.

chronically in debt and drifted through a succession of low-paid, temporary positions, despite the efforts of his friend, colleague and most supportive patron, Richard Owen. The regard both men had for each other, though, reversed dramatically when they took opposing sides in the most profound scientific and philosophical question of their day – the progression, or evolution, of life.

Owen accepted Cuvier's ideas on extinction, and acknowledged the progressive patterns of change that characterize many fossil lineages. However, in keeping with establishment doctrine, he, like many of his contemporaries, could not bring himself to break with religious dogma, especially over the issue of human origins. His younger colleague, though, had no such qualms. Huxley went well beyond simple explanations of the evidence for evolution, choosing to both reject and deride Owen's personal views, as well as his scientific interpretations, in the most castigating and personal manner, both in print and at the lectern. But rather than a simple disagreement between former associates over a popular debate, the highly acrimonious nature of Owen and Huxley's clash must also be viewed in the context of a much more far-reaching battle for influence and power within the (then) emerging field of modern science. In rejecting evolution, Owen took the side of well-to-do gentlemen clergy who pursued their scientific interests as a somewhat obsessive hobby, while Huxley took the side of those who, as a result of their circumstances as well as their personal politics, favoured the conversion of science into a profession whose practitioners would be paid for their work. Whereas the opinions of eyewitnesses differ as to whether Huxley won his famous 1860 Oxford Museum debate on evolution with the Rev. Samuel Wilberforce – who has coached by Owen[26] – evolution is now accepted almost universally, and Huxley's view of a professionalized science, divorced from religious precept and not reliant on personal patronage, so dominates our view of how science should be organized that it is difficult for most to imagine any alternative.

Telling real stories such as this regarding the naturalists and scientists who made significant contributions to our understanding of extinction and extinct species – not some oversimplified caricature that overlooks the human elements of their lives and the social factors embedded in their discoveries – alongside the stories of the specimens and/or artefacts themselves, would not only provide a critical aspect of the context within which those discoveries must be viewed, but would also attract a new audience to such exhibitions, and counteract the modern stereotype of scientists as little more than asocial thinking machines who, with rare exceptions, cannot communicate with 'normal people' other than through a jargon-rich foreign language.

This brings us, finally, to the issue of how willing museums and galleries are to mount exhibitions of extinct species, and, in so doing, engage with the extinction issue. Here, once again, art galleries will have the advantage insofar as their patron community expects these institutions' exhibitions to be experimental and controversial so as to inspire engagement with diverse audiences. Museums, on the other hand, are far more conservative by nature. Many depend on the support of regional and national governments that prioritize their basic primary and secondary school educational programmes, and view their role as being that of an established and authoritative reference rather than a source of debate, passionate inquiry and inspired engagement. Both these mindsets serve as constraints for both types of institutions in terms of presenting the extinction controversy adequately. But given the importance of this topic, its scope, and the wholly inadequate manner it has been dealt with in the past, the extinction issue embodies an unparalleled opportunity for both museums and galleries to rethink how contemporary issues can be presented to their visitors, what sort of visitors such subject matter might attract, and how, through their exhibitions, they can become a vital player and forum for the wide-ranging discussions that lie at the heart of this debate, rather than being relatively little-known and little-appreciated sideshows.

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Notes

1. Mayor, *First Fossil Hunters*.
2. Cheke, 'Dodo's Last Island'.
3. Buffon, *Histoire Naturelle*; Dugatkin, 'Buffon, Jefferson and the Theory of New World Degeneracy'.
4. Sellers, *Mr. Peale's Museum*.
5. Rowland, 'Thomas Jefferson'.
6. Cuvier, *Mémoire sur les Espèces d'Éléphans*.
7. In his 1796 monograph, Cuvier not only described the Ohio material, but also noted the living elephants in Africa and India comprised not only separate species, but separate genera. MacLeod, 'The Geological Extinction Record'.

8. This building has survived to the present day, and can be found on Broad Street in Oxford as the History of Science Museum, where it houses a leading collection of scientific instruments.
9. Conn, *Museums and American Intellectual Life*, 24.
10. Ibid., 6.
11. Conn, *Museums and American Intellectual Life*; Kubler, *The Shape of Time*; DiMaggio, 'Classification in Art'; Kopyoff, 'Cultural Biography of Things'.
12. Available in English as Schindewolf and Reif, *Basic Questions in Paleontology*. See also Schindewolf, 'Neokatastophismus?'
13. Newell, 'Revolutions in the History of Life'. See also Newell, 'Crises in the History of Life'.
14. Raup and Sepkoski, 'Mass Extinctions'. See also Raup and Sepkoski, 'Periodicity of Extinctions'; Raup, 'Biological Extinction in Earth History'; Raup, *The Nemesis Affair*.
15. Raup, 'Size of the Permo-Triassic Bottleneck'.
16. See Benton, 'Scientific Methodologies in Collision'.
17. 'Summary Statistics'.
18. Heise, *Imagining Extinction*.
19. Naish, 'Extinction'.
20. See Koch et al., 'Earth System Impacts of the European Arrival'.
21. Sax and Gaines, 'Species Diversity'.
22. Thomas, *Inheritors of the Earth*.
23. Maier, *What's So Good About Biodiversity?*
24. Latour, *Pandora's Hope*; Takacs, *The Idea of Biodiversity*.
25. Carnall et al., 'Natural History Museums'.
26. Desmond, *Huxley: The Devil's Disciple*.

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