

# **Evolution education in Canada's museums: where is human evolution?**

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## **Abstract**

While an interest in the origin of human beings may be a cultural universal, there are various views and beliefs about how this event took place. In Canada, a recent (2010) Angus Reid survey revealed that only 61% of Canadians accepted that humans evolved over millions of years; 39% of the population either believed in creationism or did not accept evolution as a scientific fact. These statistics suggest that human evolution education is a topic that needs to be addressed.

This thesis investigates the role of museums in public education about human evolution. Prior to this study, the number of Canadian museums with exhibits about this topic was unknown. Sixteen Canadian museums participated in this study, and the results demonstrated that only two had permanent exhibits on human evolution, and one creationist museum presented a biblically-based account of human origins. Here, it is argued that more of Canada's museums should consider incorporating human evolution education into their mandates.

## **Résumé**

Bien que l'intérêt envers les origines de l'Homme soit un universel culturel, plusieurs points de vue et croyances divergent au sujet du commencement de l'humanité. Au Canada, un récent sondage (2010) de la firme Angus Reid a révélé que seulement 61% des Canadiens acceptent le fait que l'humain ait évolué sur une période de millions d'années, et 39% croient plutôt au créationnisme ou ne considèrent pas l'évolution comme un fait scientifique. Ces statistiques suggèrent que l'évolution de l'homme soit un sujet qui doit être abordé.

Cette thèse étudiera le rôle que jouent les musées dans l'éducation de la population à propos de l'évolution de l'homme. Le nombre de musées canadiens présentant une exposition sur le sujet n'était pas encore connu avant la réalisation de cette étude. Selon les résultats de celle-ci, seuls deux des seize musées canadiens qui y ont pris part consacraient une exposition permanente à l'évolution de l'homme, et un autre musée, créationniste, proposait une version biblique des origines de l'homme. Cette thèse démontre que davantage de musées canadiens devraient envisager d'avoir pour objectif l'éducation de la population sur l'évolution humaine.

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## Introduction

The theory of evolution is fundamental to modern biology. It allows us to understand how the diversity of life on Earth came into being and how organisms have changed over time. As Dobzhansky stated in 1973, “seen in the light of evolution, biology is, perhaps, intellectually the most satisfying and inspiring science. Without that light it becomes a pile of sundry facts - some of them interesting or curious but making no meaningful picture as a whole” (p. 129). While the theory of evolution allows us to understand the connection between all life on Earth, past and present, there are members of society who take issue with this statement, especially concerning one particular species: *Homo sapiens*. A recent Angus Reid survey revealed that 39% of the Canadian population either believes in a creationist origin for humans, or does not accept the evolutionary evidence as scientific fact (Angus Reid, 2010). This suggests that public education about human evolution is a topic that must be addressed.

This thesis investigates the role of the museum in educating the public about human evolution. Prior to this study, the number of Canadian museums with exhibits on this topic was unknown. Therefore, the goals were to:

- 1) Determine which Canadian museums had exhibits on human evolution;
- 2) Investigate the possible reasons behind the decision to include or omit human evolution from exhibits;
- 3) Observe the messages and displays of the Canadian Creation Science Museum and compare them to science-based museums.

Staff members from nineteen Canadian natural history, anthropology, and palaeontology museums were contacted, and sixteen agreed to participate in the study. Data from the creationist museum was obtained through a site visit. The results of this study revealed that, out of the participating museums, only two had permanent exhibits on human evolution. One university had a permanent display unit dedicated to human evolution, which was located in a public hallway. The creation science museum had a permanent display on the biblical account of human origins.

In light of these findings, I propose that more Canadian museums should consider incorporating human evolution into their permanent galleries. Section I of this thesis will emphasize the importance of creating an evolutionarily-literate society, followed by a summary of the religious opposition to evolution. Section II will demonstrate that museums are ideal institutions to help increase public understanding of human evolution. Section III will provide details of the methods used and data collected, and a comparison of exhibit content between the creationist museum and science-based museums. A summary of the findings and recommendations for future action will be presented in Section IV.

## **Section I: Evolution Education**

Human evolution should be of interest to every human being, regardless of geographic origin or cultural affiliation. Yet, this subject is prone to misconceptions and misunderstandings (i.e. Nettle, 2010), and it is currently unknown if evolution, including human evolution, is being adequately taught in Canada's elementary and secondary classrooms. School curricula may or may not include it, especially at the elementary

level. To complicate the situation, even if evolution is included, there is no way to know if teachers are actually adhering to the curriculum.

In Quebec, for example, evolution is in the curriculum at both the primary and secondary levels. However, the McGill branch of the Evolution Education Research Centre (EERC), in discussions with teachers in Quebec, has found that in many schools, evolution is not actually taught (Wiles, 2006). In 2008, an article in *The Calgary Herald* commented on the results of an earlier Angus Reid poll revealing that 40% of Albertans agreed that humans were created by God within the last 10,000 years. It was mentioned that while evolution was taught in Alberta's schools, it was not done to the extent that it should be. It was stated that evolution is a component of two high school biology classes, but these two courses are optional for students (Breakenridge, 2008).

British Columbia's curriculum also made national headlines in the 1990s, when it was discovered that public schools in Abbotsford, B.C. had been using creationist materials in science classrooms since the late 1970s (Numbers 2000, p. 404). There are many examples of situations such as these, but one thing is clear: the quality of evolution education across Canada is inconsistent.

### **Why is it Important to Understand Evolution?**

Human health is an area that is of particular concern to the general population. Examining this issue from an evolutionary point of view may help people understand the relevancy and applicability of the theory of evolution. One topic that is often in the news is antibiotic resistance, a perfect example of evolution by natural selection. Health Canada explains that antibiotic resistance evolves when "an antimicrobial drug is no

longer effective in killing or stopping the growth of particular microorganisms, such as bacteria” (Antibiotic Resistance, 2005). When antibiotics are used inappropriately (for example, when people ask for antibiotics for a viral infection, or they do not take the full dose of antibiotics), the weak bacteria are killed, while resistant bacteria survive, and pass on this resistance to the next generation.

Basic knowledge of our physical evolution can also shed light on many human ailments. Bipedal locomotion was the earliest hominid characteristic to evolve, and humans are the only extant primates whose primary means of locomotion is bipedalism. However, our ancient ancestors were quadrupedal, and knowing the history of our physical evolution can help us understand the costs involved when the weight once distributed on four limbs was reduced to two (Mindell, 2006). While bipedalism has undoubtedly provided numerous benefits, it has also led to lower back, hip, and knee problems.

Another implication of bipedalism was that the pelvis became shorter and broader. Mindell (2006) points out that this had serious implications on the female birth canal. Combined with an increase in infant cranial size, the result was that the birth canal was only slightly larger than the skull, creating increased risk of complications during childbirth.

Understanding evolution is also vital to the development of medical treatments, such as identifying the source of particular HIV strains (Nelson 2000, p. 29). Alters & Alters (2001) mention that aspects of genetic diseases must also be understood from an evolutionary perspective. For example, examining them in an evolutionary context can allow researchers to see that “even lethal genes can remain in a population if there is a



reproductive advantage in the heterozygote, as in the case of sickle-cell anemia and malaria” (p. 109).

Our evolutionary history can also help explain other current health issues, particularly in Western societies, such as the prevalence of obesity, heart disease, high blood pressure, and diabetes. Although many people would agree that overindulging in foods that are high in fat, salt, and sugar is unhealthy, we seem to possess an almost insatiable appetite for these substances. Birch (1999) has explained how our genetic predispositions for craving these foods are instinctive reactions. Because we need sugar, fat, and salt to survive, an appetite for these foods was likely adaptive for our ancestors. However, now that we have easy access to them, our health is suffering. Krebs (2009) calls this a mismatch between evolved preferences and our modern environments. Evolutionary psychologists would explain this as an adaptive lag, meaning that many of our current behaviours are not adaptive in modern environments.

There is no doubt that applications of evolutionary theory are becoming increasingly important in our lives. As Mindell (2006) concludes, “evolution is not just useful, it has become indispensable” (p. 313). What is the danger of evolutionary illiteracy? It can affect everything from “combatting pathogens to understanding biodiversity... a policy of intentional ignorance is not only academically irresponsible, it is dangerous” (Gregory, 2008a). There is no doubt that evolution education is vitally important to us as a society, yet the question still remains: how can we increase understanding among the general population? One possible strategy may be to use human beings as evolutionary examples.

Using humans can be an effective strategy for explaining evolutionary concepts. There have been astounding discoveries from the fields of biological anthropology, palaeoanthropology, and genetics, providing an excellent opportunity to educate people about their evolutionary history. As Nickels (1998) rightly points out, by using humans in explaining evolution “we get to deal with the organism that more people and students are most inherently interested in than any other: themselves” (p. 24). Focusing on humans as products of evolution helps people understand how we fit into the evolutionary tree of life. However, the opposite appears to be happening. In general, when evolution is taught, human evolution is often left out. There are undoubtedly many reasons for this, including lack of education, political or psychological factors, and religious influences.

### **Misunderstandings and Misconceptions**

While it may come as no great surprise that the theory of evolution is not well understood in society as a whole, even those with some science education can hold misconceptions (Nettle, 2010). T. Ryan Gregory (2008a), an evolutionary biologist who teaches an upper year course in evolution at the University of Guelph in Ontario, has compiled a list of common misconceptions held among university students. He states that many students are surprised to learn that:

- 1) Humans are not descended from chimpanzees;
- 2) Scientific theories are well-supported explanations of scientific facts;
- 3) Individual organisms do not evolve in response to environmental challenges;
- 4) Animals do not do things for the “good” of their species;
- 5) Natural selection is the opposite of random chance;

- 6) Not every feature of an organism represents an adaptation;
- 7) Vestigial does not mean non-functional;
- 8) There is no progressive pattern in evolution leading to humans as the pinnacle;
- 9) Although humans are now the only living members of the group, several species of hominids co-existed in the past.

Nettle, also teaching at the undergraduate level, has noted other general misunderstandings, such as the failure to distinguish between processes which individual organisms undergo and those which populations undergo (Nettle, 2010). He postulates that explaining evolution using non-human animals may actually inhibit learning, and that if humans are used as examples, students are more likely to understand evolutionary concepts.

The concept of Deep Time is also difficult to fathom, and Scott (2007) argues that “misunderstanding...the scale of evolutionary history is the biggest problem to plague the public’s knowledge of human evolution...” (p. 43). Another common misconception about evolution is that “it is just a theory.” In fact, the word theory has very different meanings, depending on the context in which it is used. In everyday layman terms, theory is often used synonymously with speculation, whereas in science, theories “mean an explanation of phenomena that have been rigorously tested” (Alters & Alters 2001, p. 87). If these misconceptions are present among university students, then the situation among the general public is possibly much worse.

## Opposition to Evolution

Nelson (2000) finds it puzzling that many people reject or do not understand the central theories of science, especially a theory such as evolution, which has strong scientific support. Eve & Harrold (1991) pose a similar question: why the continuing debate over evolution? They note that “we do not find public arguments about whether atoms or gravity exist” (p. 2). A lack of science education cannot be solely to blame, as it can be argued that the theory of electro-magnetism or gravitational theory may be just as complicated to learn as the theory of evolution; yet these theories do not appear to generate the same type of controversy as evolution. Therefore, it seems likely that social and psychological forces may play a greater role in people’s acceptance of evolution than they do for other scientific theories.

While most Canadians tend to think that anti-evolution is an issue unique to the United States, this is not the case. An incident at the Royal Ontario Museum (ROM) two years ago reminded us that evolution remains a controversial topic in Canada. When the ROM decided to host the American Museum of Natural History’s traveling exhibit on Charles Darwin, they initially had great difficulty in finding a sponsor for the exhibit, an unusual circumstance at the museum. A news article on the exhibit noted that “his [Darwin’s] work remains highly controversial to this day” (ROM Newsroom, 2008a). William Thorsell, Director and CEO of the ROM, stated that “at *Darwin’s* recent media preview, I mentioned the interesting fact that in Canada in 2008, as also happened in the United States with sponsorship, there is resistance to getting too close to Darwin, the exhibition, because of the excitement that Darwin, the scientist, is still able to create” (ROM Newsroom, 2008a). Upon learning that the exhibition did not have a

corporate sponsor, both the Humanist Association of Canada and the United Church Observer Magazine offered their monetary support (ROM Newsroom, 2008a). Later, two other sponsors, Blyth Academy and ZINC Research, also offered assistance (ROM Newsroom, 2008b). This situation suggests that, for large corporations at least, there may be anticipated concern of political or economical repercussions when showing support for the theory of evolution.

Another area to examine is general acceptance of the theory of evolution. A 2010 Angus Reid Public Opinion Survey asked a sample 1,009 Canadians to state their opinion on human evolution. Participants were asked to choose one of the following statements:

- 1) Human beings evolved from less advanced life forms over millions of years
- 2) God created human beings in their present form within the last 10,000 years
- 3) Not sure

The findings revealed that 61% accepted the evolutionary statement, while 24% believed in creationism. However, another 15% answered “not sure,” meaning that 39% of respondents were not comfortable stating that human beings are the product of evolution. Gregory (2008b) also notes that a 2007 Angus Reid poll showed that 42% of Canadians believed that humans and dinosaurs coexisted, despite a majority of the population stating that they accepted evolution. He notes that this is not so surprising, given that media representations often portray humans and dinosaurs together (Gregory, 2008b). While some people may merely be misinformed, there is a significant percentage of Canadians that hold creationist beliefs about the origin of life and the

history of the Earth. The following section will provide a background of creationism and the creationist movement.

### **After Darwin's *Origins*: The Beginning of Modern Creationism**

Very few would deny that up until the nineteenth century, the Western scientific world, and the public in general, accepted the biblical account of creation. McCalla (2006) explains that the Bible was generally seen as the authoritative text not only on spiritual truth, but also chronology, geography, and history. Archbishop Ussher's claim that creation took place in 4004 B.C. was generally accepted, although geologists, for example Charles Lyell, suggested that the Earth might be much older (for details see Lyell, *Principles of Geology v.I-III*, 1830-1833).

In 1859, however, a book was published that threatened to challenge the truthfulness of the Bible. This was Charles Darwin's *On the Origin of Species by means of Natural Selection*. An alternative to the Biblical account of the diversity of living things was put forth; natural selection could explain such events, without relying on supernatural forces (Eve & Harrold, 1991). As might be imagined, this created quite a conundrum for large numbers of people who thought that if evolution by means of natural selection was true, then the creation account of the Bible was incorrect.

Although in the beginning there was disagreement among the scientific community, most of its members eventually accepted Darwin's theory as the best explanation to account for the origin and diversity of species (Eve & Harrold, 1991). In North America, the latter part of the nineteenth century and the beginning of the

twentieth century saw a rapid acceptance of Darwin's theory among the scientific community (Eve & Harrold, 1991; Scott, 2006).

It is important to note that the public was, generally, not aware of the new debates taking place. Eve & Harrold (1991) note that while no polls exist from the late nineteenth century, "indicators were that most citizens of the time neither knew nor cared about the theory of evolution" (p. 20). By around 1900, biology textbooks had integrated evolution. However, the early twentieth century also saw another trend: the growth of public education. Eve & Harrold (1991) explain that during this time, many middle and working-class parents began to send their children to secondary school, and were shocked to find out that their children were being taught views that deeply contradicted their religious beliefs. While the scientific community had accepted the theory of evolution, the American public had not reached a similar level.

On the eve of the twentieth century, modern Christian fundamentalism emerged in America, and was to play a significant role for decades to come, and indeed into the present day. With the public concern about teaching evolution becoming more prominent in society, fundamentalists re-affirmed the belief that adolescence was an extremely important time in a young person's life, especially concerning his or her moral development. Antievolution measures were needed to protect people from the moral, and spiritual, dangers that evolution was sure to bring (McCalla, 2006). This, combined with a resistance against modernism and change in general, helped lead to the extreme measures taken against evolution education in the 1920s.

The antievolution movement in America during the 1920s was the first large Christian fundamentalist movement that had as its goal the banning of the teaching of

evolution. Led by prominent individuals, such as the well-known political figure William Jennings Bryan, the antievolution movement gained momentum and public support.

When Bryan learned of a bill introduced in Kentucky to ban the teaching of evolution in public schools, he took advantage of the opportunity and, along with other religious leaders, introduced antievolution bills into twenty state legislatures during the 1920s (Eve & Harrold, 1991). This included the Butler Act passed in Tennessee, which led to the Scopes Trial of 1925 (for complete details, see Eve and Harrold, 1991; Scott, 2006; McCalla, 2006).

While Bryan and his supporters may have officially been successful, as it was ruled that evolution could not be taught in the classroom, in other ways they failed. The media portrayal of the antievolutionists was largely of “ignorant hillbillies resisting the progress of science and civilization” (Eve & Harrold 1991, p. 26). Shortly after the trial, Bryan died, and with their leader gone, the antievolution movement lost some of its thrust. Scott (2006) notes that “even without formal banishment, evolution disappeared. In the South, teachers and parents who chose textbooks preferred ones that slighted evolution, so textbook publishers were quick to remove, downplay, or qualify evolution to make sales” (p. 4). She goes on to point out that these books were obviously sold elsewhere in the States as well, resulting in evolution almost disappearing from textbooks all over the country for the next thirty years.

One of the stimuli for the resurgence of the creationist movement came from a surprising event: the launch of Sputnik by the USSR in 1957. Eve & Harrold (1991) explain that Americans had commonly viewed the Russians as technologically backwards, and were shocked when they surpassed the U.S. in space research. In



effect, this acted as a wake-up call; Congress allocated millions of dollars to encourage scientific research and training, including providing funds to the National Science Foundation (NSF), which were used for the Biology and Sciences Curriculum Study.

The centennial of Darwin's publication of *Origins* also took place in 1959. Harding (2000) states that this caused scientists, in particular biologists, to take an interest in educational reform. During the 1960s, a new biology curricula was developed in partnership with NSF, and evolution was once again being emphasized. As a result, fundamentalists, who had been fairly inactive over the past few decades, reemerged, and the conflict resurfaced in the form of the modern creationist movement.

In 1972, the Institute for Creation Research (ICR) was established by Henry Morris and his colleagues near San Diego, California. Morris, a creationist who believed in a literal interpretation of the Bible, sought to do something different from his predecessors - he wanted to prove that "special creation" could be supported by science (Scott, 2006). In the past, creationists had claimed that evolution had no scientific basis; now, they were arguing that science could be used to shed light on the creation of the Earth and of life, but that it proved that a creator, or designer, had to be behind the process.

The ICR did not seek to convert scientists to creationism; rather, their work was directed at the general public, and in "recalling Christians to the plain sense of the inerrant Bible" (McCalla 2006, p. 179). However, several different creationist interpretations have emerged from the amalgamation of Bible and Science, and there is no general consensus among creationists as to which one is correct. These interpretations include:

- 1) Young Earth Creationism: a conservative and fundamentalist position which takes the creation account in Genesis literally, including a recent creation of humans (less than 10,000 years).
- 2) Old Earth Creationism: accepts that millions of years may have passed between “in the beginning” and the six days of creation described in Genesis (Gap Theory). Advocates acknowledge some evolutionary views, in the form of theistic evolution, but believe that mankind was created relatively recently.
- 3) Scientific Creationism: by the 1970s, creationists such as Morris were attempting to make the biblical account of creationism more compatible with the discoveries of modern science (Numbers, 2000). Currently, both Young and Old Earth Creationists identify with this position; they argue that science does not refute their beliefs, but actually proves that they are correct.
- 4) Intelligent Design: claims that parts of evolutionary theory might be correct, but there are still many gaps, which can only be explained by the intervention of a Designer. It is not claimed that this Designer has to be the Christian God - alternate explanations, such as intelligent extraterrestrials, have been put forth. However, adherents make clear that they believe God is the agent (Scott, 2006).

### **Canadian Creationists**

*George McCready Price*

Price was born in New Brunswick in 1870. After his father passed away, the family joined the Seventh-Day Adventist Church, an offshoot of the Millerite movement led by Ellen G. White (Numbers, 2000). White claimed to receive divine messages in

trancelike visions, and her pronouncements were placed on par with the Bible, at least with fellow Adventists; her ministries were to deeply influence Price in years to come.

After graduating from a one-year teacher-training course, Price was offered a position in a remote village on the Gulf of St. Lawrence, where he met Dr. Alfred Corbett Smith. Smith, a Harvard Medical School graduate, asked his young friend about his views on evolution, and upon finding out Price was a creationist, offered to lend him books on evolution from his library. Although he reportedly considered accepting this line of reasoning at times (Numbers, 2000), Price eventually returned to Ellen White's work, especially her suggestion that the deluge and related events had buried fossils worldwide, and eventually came to the conclusion that evolution was refuted, based on the "facts of the rocks and fossils" (Numbers 2000, p. 92). Price truly believed that he had found a fatal flaw in evolutionary geology, and was convinced that "God wanted him to enter this unworked field" (Numbers 2000, p. 92). He proposed a reconstruction of the science of geology on the basis of events described in the Bible, meaning recent creation and worldwide catastrophe, namely Noah's flood.

Price's true ambition was to become a writer, and he decided to move to New York to pursue his passion. Unfortunately, the following years did not bring him much luck, and he took a position as the principal of a small Adventist school in Oakland, CA. He eventually borrowed enough money to self-publish a small paperback, *Illogical Geology: The Weakest Point in Evolution Theory* (1906). Numbers (2000) notes that Price believed his important discovery centered around the statement that it was impossible to prove that one fossil was older or younger than any other fossil, and therefore, the fossil record lent no support to theories of evolution. Price distributed

hundreds of complimentary copies of the book to scientists, requesting feedback. One man who replied to him was David Starr Jordan, president of Stanford University and the leading American authority on fossil fish (Numbers, 2000). Jordan attempted to help Price see that his case against geology was “based on scattering mistakes, omissions and exceptions against general truths that anybody familiar with the facts in a general way can not possibly dispute” (Numbers 2000, p. 106). Jordan repeatedly but unsuccessfully urged him to undertake some constructive work in palaeontology in the field and in laboratories.

Undeterred, Price held strong to his beliefs, eventually publishing a college textbook entitled *The New Geology*, again featuring the flood as the central geological event in the history of the earth (Numbers 2000, p. 98). By the late teens, Price’s postulations were beginning to appear in fundamentalist publications, and before the Scopes trial, Bryan’s advisors recommended that Price be invited as an expert witness. Price, however, had to send his regrets, as he was overseas at the time.

Price has been called “the chief architect of flood geology,” (Numbers 2000, p. 8), and indeed, his work was to influence future creationists, such as Henry Morris. Morris stated that reading *New Geology* was “a life-changing experience,” and believed Price to be a leading authority on historical geology (Numbers 1992, p. 194). While Morris may have attempted to omit direct references to Price in his work, mainly because of Price’s Adventist influence, Morris’ section of the jointly-published *The Genesis Flood* (1961) was by all accounts, an “updated version of [Price’s] *New Geology*” (Numbers 1992, p. 200). Although Price was most active as a fundamentalist in the U.S., the basis for his creationist ideas developed from his religious upbringing in

Canada as a Seventh Day Adventist, and he was to have a significant influence, through Morris, on the modern creation science movement.

### *Sir John William Dawson*

Another influential Canadian creationist was Sir John William Dawson, Principal of McGill University and the first Director of the Redpath Museum. It is interesting to note that the Redpath, today a respected museum of natural history, was conceived in a creationist environment and controlled by a man who rejected the theory of evolution, and continued to do so all his life. Dawson, similar to Price, painstakingly looked for correlations between Genesis and scientific knowledge. For his entire life, Dawson remained convinced that Noah's flood had taken place (Trigger, 1966).

At the opening of the Redpath Museum in 1882, Chancellor Day presided over the ceremony with the words "we dedicate the Peter Redpath Museum to the study of the varied and wonderful manifestation of God's creation" (Bronson 1992, p. 87). The religious undertones were not exactly downplayed inside the museum, either. To divide the museum, it was decided that "Man's Work" (for example cultural artifacts) would be situated in the vestibule, and the "Works of God" (the natural world) would be in the Great Hall (Bronson, 1992). Dawson believed that men, and their creations, were inherently corrupt. While the Redpath Museum's creationist beginnings have long been eradicated, the example of Dawson's role as Director is evidence of the power one individual had over the organization and administration of the museum.

## **The Current State of Affairs of Creationism in Canada**

Barker (2004) suggests that one reason why creationism is not as visible in Canada is the inability of creationist groups to find political allies. However, the situation differs slightly by region; for example, creationist beliefs are strong in British Columbia and Alberta, provinces with large, conservative Christian populations (Barker 2004, p. 96). Also, there have been several instances of politicians and those in government-appointed positions who remind us that creationism is present in Canada. Numbers (2000) mentions Stockwell Day, a Pentecostal preacher from Alberta and member of the conservative Canadian Alliance, who declared that “the Earth is 6,000 years old, humans and dinosaurs roamed the planet at the same time, and Adam and Eve were real people” (p. 404). More recently, Canada’s Minister of State for Science and Technology, Gary Goodyear, refused to say whether or not he “believed” in evolution: “I’m not going to answer that question. I am a Christian, and I don’t think anybody asking a question about my religion is appropriate,” he said in an interview with *The Globe and Mail* (2009). To make matters worse, Goodyear was at the centre of a controversy over federal funding cuts to science researchers (McIlroy, 2009). Goodyear, however, later clarified that he did “believe” in evolution: “we’re evolving all the time... of course I believe in evolution” (CBC, 2009a). However, he then went on to provide examples of evidence for this claim from his experience as a former chiropractor: “that’s a fact, whether it’s to the intensity of the sun, whether it’s to ... walking on cement versus anything else, whether it’s running shoes or high heels, of course we are evolving to our environment, but that’s not relevant and that’s why I refused to answer the question” (CBC, 2009b). While Goodyear was attempting to

provide evidence that he does, indeed, accept evolution, the examples he brought up were cause for further concern. Dr. Elizabeth Elle, a biology professor at Simon Fraser University, noted that the statement “demonstrates a fundamental misunderstanding of how evolution by natural selection works” (CBC, 2009b). While she of course acknowledged that we are evolving, humans are “being naturally selected for characteristics such as resistance to certain diseases, but not likely for the type of footwear they use” (CBC, 2009b).

While there is no debate, among the scientific community, that understanding evolution is essential to understanding biology, it remains a challenge for scientists and educators to help Canadians understand all aspects of evolution, especially those aspects concerning ourselves.

Craig Nelson, a noted researcher in evolution education, poses an interesting question: how can we produce a scientifically literate society, especially in areas that are publicly controversial? Nelson suggests active learning as an effective strategy in dealing with scientific misconceptions.

I would argue that there is perhaps no area as controversial as human evolution. Taking this further, I would suggest that informal educational institutions, notably museums, can also play a role in public education about human evolution, as they are ideal places for active learning and discovery to take place.

## Section II: The Museum

Museums are arguably among the most important informal education institutions. By definition, museums are organizations in the service of society, acting to preserve and exhibit artifacts and objects for study and education. Arnold (2006) also notes that authenticity is important for museums: “we implicitly trust museums...to expend considerable effort in finding out and telling us the truth about their contents” (p. 93). The public’s trust in museums is important, and most museums are committed to ensuring that they retain this trust. Siegal (2008) explains that the museum is not the natural home of any of the objects on display. Since artifacts are displayed and stored out of their natural context, the obligation for museums to “tell the truth” becomes even more crucial. Museums must be committed not only to safely house the objects entrusted in their care, but to interpret their history and relevance for the public.

Science and natural history museums have an additional role: to function as mediators between the scientific community and society. Scientific research and discoveries must go through a sort of transformation before being transmitted to the public; a museum’s educational department and exhibit development team must decipher potentially confusing or complex information. Their responsibility is, in effect, to translate this knowledge so that it can be understood by those who may not have a background in science.

Evolution is a particularly important subject for museums to present in their exhibits. As previously noted, evolution education is not uniformly taught in Canadian schools. While no Canadian study has been previously undertaken, Genie Scott (2006) explains that in the U.S., “in some ways, we are more dependent upon museums than



ever before. The coverage of evolution in high school is pretty skimpy. Museums can supplement instruction on evolution in important ways” (p. 7). They can bring objects and artifacts to life, and cater to more learning styles than lectures or textbooks.

Museums can be seen as “stewards of science,” entrusted by the public to care for artifacts and objects. They have an obligation to present and interpret scientific theories, which becomes increasingly important in areas of potential controversy and high levels of misunderstanding, such as human evolution.

While it is clear that there is a need for more education about this topic, the difficulty lies in finding out who is responsible and best-suited for the job. The classroom is an important first step in evolution education, but is somewhat limited in terms of active learning. Museums, however, are prime institutions to educate people in an interesting, even entertaining, fashion. “Museums are one of the primary ways that both children and adults are exposed to evolutionary ideas” (Spiegel, Evans, Gram & Diamond 2006, p. 72).

Diamond and Scotchmoor (2006) stress the “extraordinary drawing power” (p. 21) of museums. In an age of increasing entertainment options, museums can still remain enjoyable and educational for people of all ages. One major enticement of going to a museum is the opportunity for interaction with real objects. In the context of evolution in general, Diamond and Scotchmoor (2006) state that:

natural history museums engage visitors with the phenomena of evolution by using real fossil specimens, slabs of actual rock matrix, artist’s renditions of past environments, working palaeontology labs, discovery rooms, and interactive and virtual exhibits. These are all ways that museums reinforce to visitors that their exhibits are authentic representations of scientific research (p. 43).

An effective museum is interactive and inquiry based; it offers multiple opportunities for learning over time. For example:


many exhibits are permanent installations that are visited repeatedly by children. This means that concepts not accessible at one age can be re-experienced at another, often with the advantage of being able to scaffold one experience upon the other (Diamond & Scotchmoor 2006, p. 42-43).

As West (2005) aptly states, “natural history museums are the one place that the general public comes face to face with the results of evolution” (p. 25). As evolution is so integral to understanding biology, many different types of museums are in excellent positions to integrate the theory, and to include the evolutionary history of humans. Natural history and anthropology museums are the obvious choices, and palaeontology and geology museums may also integrate humans into their displays, to show just how recently, in terms of geologic time, hominids have arrived on the scene. Prior to this project, there did not appear to be any literature about whether Canada’s museums were integrating human evolution into their displays and exhibits. The following section will detail the results of this study.

### **Section III: Data and Methods**

For this study, a descriptive method of research design was implemented. A list of Canadian museums was compiled, and staff members at the following museums were contacted by e-mail and invited to participate in the study, which involved completing a short questionnaire.

<b>Museums Housed within University Departments</b>	<b>Natural History Museums</b>	<b>Natural History/ Anthropology Museums</b>	<b>Anthropology Museums</b>	<b>Palaeontology and Geology Museums</b>	<b>Creation Science Museum</b>
Anthropology Museum, University of Winnipeg (Department of Anthropology)	Canadian Museum of Nature	Manitoba Museum	Canadian Museum of Civilization	Fundy Geological Museum	Big Valley Creation Science Museum
Simon Fraser Museum of Archaeology and Ethnology (Department of Archaeology)	Musée de la Nature et des Sciences	New Brunswick Museum	Museum of Anthropology, University of British Columbia	Joggins Fossil Institute	
University of Alberta Museums (Department of Anthropology)	Nova Scotia Museum of Natural History	Redpath Museum		Royal Tyrrell Museum of Palaeontology	
		Royal Alberta Museum			
		Royal BC Museum			
		Royal Ontario Museum			
		Royal Saskatchewan Museum			
		Yukon Beringia Interpretive Centre			

 \* staff members from these museums participated in the study

For comparative purposes, two American museums (American Museum of Natural History and the Yale Peabody Museum) were contacted, and both agreed to participate in the study.

A site visit to the Big Valley Creation Science museum was undertaken, as well as an American creation science museum (Creation and Earth Science Museum, California) for comparative purposes.

Site visits were also undertaken to the American Museum of Natural History, the Royal Tyrrell Museum, the Redpath Museum, the Manitoba Museum, and the University of Winnipeg Museum of Anthropology.

Staff members who participated included Directors, Curators, Education Programmers, and Department Heads. Participants were given a choice of having their name and position kept confidential. Therefore, names have been omitted in certain cases.

### **Questionnaire:**

If human evolution was presented at their museum, participants filled out Section A. If human evolution was not presented at their museum, participants filled out Section B.

### **Questions in Section A:**

- 1) What types of permanent exhibits, displays, or activity centres on human evolution are present at your museums? Please describe the main themes covered.
- 2) Have you had any traveling/special exhibits at your museum on or related to human evolution? If yes, please explain the nature and content of these exhibits.
- 3) Does your museum feel that educating the public on human evolution is important? Why or why not?
- 4) Are you aware of any controversies related to any of these exhibits? Include any issues with funding, donors, visitor comments, etc.

### **Questions in Section B:**

- 1) What are some possible reasons why your museum does not portray human evolution?
- 2) What is the role of the museum in educating the public on human evolution?
- 3) What is an appropriate venue for presenting information on human evolution to the public?
- 4) Have you had any traveling/special exhibits at your museum on, or related to, human evolution? If yes, please explain the nature and content of these exhibits.

## Canadian Museums - Results

I. Permanent exhibits on human evolution	II. Within University Departments, current or past exhibits on human evolution	III. Temporary exhibits related to human evolution	IV. Aspects of human evolution in exhibits	V. No exhibits on human evolution	VI. Creationist displays of human origins
Manitoba Museum	Anthropology Museum, University of Winnipeg	Royal Tyrrell Museum	Fundy Geological Museum	Canadian Museum of Civilization	Big Valley Creation Science Museum
Redpath Museum	Simon Fraser Museum of Ethnology and Archaeology		Royal Saskatchewan Museum	Canadian Museum of Nature	
	University of Alberta Museums, Dept. of Anthropology			Joggins Fossil Institute	
				Musée de la Nature et des Sciences	
				Nova Scotia Museum of Natural History	
				Royal Alberta Museum	
				Royal BC Museum	
				Royal Ontario Museum	

## **I. Museums with permanent exhibits on human evolution**

### The Manitoba Museum

This museum has a basic exhibit outlining human evolution, as it was understood at the time the exhibit was constructed (early 1970s). Regarding the role of the museum in educating the public on human evolution, Dr. Graham Young, Curator of Geology and Palaeontology, states that “this museum’s policy is to present science as it is best understood. Human evolution is, of course, an important scientific topic.” He notes that while the current exhibit is outdated, there are plans to update it within the next few years.

In terms of controversies related to the exhibit, Dr. Young has noted that there has been very little controversy about the topic of evolution, human or otherwise.

### ***Presence of Key Terms and Explanations of Evolutionary Mechanisms:***

While evolutionary mechanisms are not explained within the human evolution exhibit at the Manitoba Museum, a display close by, *The Process of Evolution*, addresses several key concepts. For example, “Man the Selector and Nature the Selector” demonstrates how artificial selection differs from natural selection. Another panel defines species (according to the biological species concept), and explains that “*species evolve by slow, accumulative changes in their hereditary composition, due to natural selection.*” Extinction of species is also addressed, and is explained as “*a natural and inevitable process.*” Climate, competition, and disease are listed as possible causes of extinction, and the role of human beings in recent extinction events is also noted.

This section ends with a discussion on common ancestry. It is stated that *“it is apparent that all forms of life are interrelated and probably arose from a single source of life. Man’s hereditary pool has therefore been derived from ancestral animals, and earlier from reptiles, then amphibians and fish, and so on, back through history.”*

Vestigial traits are also addressed, and examples include: 1) similarities of developmental pathways of the young with other types of animals (gill pouches in a stage of unborn human); 2) organs in man which were functional in ancestral animals (appendix, internal remnant of tail, third fold in the inner angle of the eye, muscles attached to the ear).

### ***Types of Displays and Evidence Presented:***

An exhibit on “Man’s Recent Ancestors” states that *“man, like other animals, has evolved to his present form.”* Four cranial casts, along with text panels, are present.

Below is a summary of the information:

- 1) *Homo sapiens sapiens*: moderns replaced Neanderthals about 30,000 years ago. Also explains that man continued to develop culture and transmit it from generation to generation, and that culture sets man apart from all other animals.
- 2) *Homo sapiens neanderthalensis*: occupied caves, used fire, and was able to withstand the subarctic conditions of glacial Europe. Developed a sophisticated tool industry (the Mousterian); brain capacity was at least as large as modern man’s.
- 3) *Homo erectus*: contemporary of the late Australopithecines, continued the pebble-chopper tool tradition of the Australopithecines. Use of fire. Except for the skull, *H. erectus* had a modern skeleton (evolved by about 500kya).
- 4) *Australopithecus*: evolved about 5 million years ago; the first ancestral man to walk upright. Was definitely a toolmaker and a meat-eating hunter. Small in stature, but had a brain larger than that of an ape.

Next to these casts is a display called “Tools of Early Man,” with examples from the Lower, Middle, and Upper Palaeolithic. Beside the casts is a chart entitled “Man’s

Pedigree,” stating that “*man, after all, is an animal and a primate. This chart indicates man’s relationship to the other primates.*”

### Redpath Museum

Barbara Lawson, Curator of World Cultures, believes educating the public on human evolution is of “vital importance - it is basic to one’s understanding of what it is to be human.” Ingrid Birker, Science Outreach Coordinator, also notes that human evolution is part of the secondary-level curriculum in the Quebec school system.

While unaware of any controversies related to the exhibit at the Redpath, Ms. Lawson notes that “I am aware of the many controversies related to museum presentations on the topic. These controversies have been the subject of several lectures presented to the public at the Redpath Museum.” In addition, the museum hosts an annual series of evolution-related lectures and activities on Darwin’s birthday.

### ***Presence of Key Terms and Explanations of Evolutionary Mechanisms:***

Key terms relating to evolution are used in display text throughout the museum (adaptation, evolution, extinction, species), but are not explicitly defined.

### ***Types of Displays and Evidence Presented:***

The exhibit on human evolution consists of a display case and wall-mounted panels. The panels illustrate hominid expansion using maps. It is stated that:

*until the appearance of Homo erectus nearly 2 million years ago, hominids were confined to the grasslands and savannah of tropical Africa. As a more complex and highly evolved species, Homo erectus was able to expand into new environments, reaching Asia as early as 1.8 million years ago, and Europe by 800,000 years ago.*



The display cases contain examples of tool assemblages, as well as reconstructions of Upper Palaeolithic art and bone carvings. A selection of hominid cranial casts illustrates the timeline of human evolution. Included are: *A. afarensis*, *A. africanus*, *A. bahrelghazali*, *A. boisei*, *A. robustus*, *H. rudolfensis*, *H. habilis*, *H. ergaster*, *H. erectus*, *H. heidelbergensis*, *H. sapiens neanderthalensis*, *H. sapiens sapiens*.

A small text panel addresses a common misconception related to human evolution: “*humans did not evolve from apes, but rather humans and African apes share a common ancestor. Studies of DNA indicate that the split in the lineages occurred somewhere around 7.7 - 5.5 million years ago.*”

## **II. Museums within universities with current or past exhibits on human evolution**

### Anthropology Museum, University of Winnipeg

The museum is an administrative unit of the Anthropology Department, and consists of three display cases in the hallway. While there are no permanent exhibits, curator Val McKinley notes that faculty, staff, and students occasionally mount temporary exhibits on human evolution as class projects or through independent research courses, or through a museum studies course Ms. McKinley sometimes offers. She also states that in the near future, she hopes to mount another temporary exhibit on human evolution.

The human evolution collections are used mainly for demonstration purposes in the classroom and lab. Ms. McKinley explains that the museum shares the Anthropology Department’s mission to explore “both the cultural and biological background of human evolution.” Therefore, she stresses the importance of

“communicating information about human evolution to our students, as well as to a broader public audience.” She also states that, because the museum is associated with the University, the environment is generally conducive to discussion, including topics that are deemed controversial.

#### Simon Fraser University Museum of Archaeology and Ethnology

Dr. Barbara Winter, Director, noted that they had a temporary exhibit on human evolution some years ago. She developed the exhibit using casts of hominid remains from the Department of Archaeology. Dr. Winter mentions that she received no negative comments about the exhibit, but rather positive comments from archaeology and other university students. However, she does explain that since the museum is located within the main campus building, the visitor demographics are affected. Hoping to develop a web version of the exhibit, Dr. Winter applied for funding from Heritage Canada, but the application was unsuccessful.

Dr. Winter believes that public education on human evolution is important, especially to “counter many of the ‘arguments’ put forward by those who do not use a scientific approach to the question of the nature of human beings.” Because of the current lack of funding which prevents her from developing a web project on human evolution, Dr. Winter must refer interested people to other websites. She believes that “the more exposure people have to information on human evolution, the more it will be more broadly accepted, especially by younger audiences.” She provides examples of appropriate venues for this, such as videos, the web, gallery exhibits, etc.

## University of Alberta Museums, Department of Anthropology

The Department of Anthropology has a permanent exhibit in two public hallways, and one section deals with human evolution (*In the Anthropologists' Footsteps*). There is also a smaller, rotating exhibit in the main office, open to the public during office hours.

A staff member within the Department noted that while their collections have the mandate to be educational in context, they are somewhat limited, as they do not have a designated building or public exhibition space dedicated to the collections. However, opportunities for engaging with the public present themselves at Open House, during children's programs, and visits from local schools. This informant also mentioned that they are trying to have a separate, dedicated museum facility designed and built on campus. In general, the exhibit on human evolution has garnered positive responses, and negative comments are rare. Although there are sometimes questions from students about the Christian view of evolution, the staff deals with them by discussing the differences between religious belief and scientific theory.

### **Comparative Case Study:** *Yale Peabody Museum of Natural History (U.S)*

Jane Pickering, Deputy Director, strongly supports educating the public on human evolution: "our museum's mission is to increase people's understanding and appreciation of the Tree of Life, including our own species and its history." She notes that, although they were prepared for controversies relating to the exhibit, "I have had no comments about the exhibit content."

### ***Types of Displays and Evidence Presented:***

They have a permanent, 1,000 square foot exhibition on human evolution. This comprehensive exhibit is divided into two sections, with part one telling the story of people who have helped shape our understanding of human evolution, and part two focusing on the fossil record, from *Sahelanthropus* to *Homo*.

### **III. Museums that have had temporary or past exhibits on human evolution**

#### Royal Tyrrell Museum

The Royal Tyrrell Museum of Palaeontology focuses on ancient life, and is centred around the theory of evolution. While they do not focus on humans, they had a special exhibit for 2009-2010 on Darwin entitled “*I Think.... (Charles Darwin, 1837)*” which had a section that addressed human evolution. Lisa Making, Head of Strategic Initiatives, explains that the exhibit focused mainly on Darwin’s theories as they relate to palaeontological studies.

In regards to controversies, The Royal Tyrrell often receives comments from visitors who do not accept evolution. Ms. Making’s response to this is that “people are welcome to believe what they wish. We are a scientific museum and what we present is based on the scientific process. We make no apologies or concessions for our displays.” Kathryn Valentine, Director of Exhibits and Communication, also commented on antievolutionist sentiments from visitors, stating that “many are simple statements encouraging us to tell all sides of the story; some are aggressive and condemning; all of them accuse us of lying and presenting half-truths.” She also noted that creationist groups often arrive at the museum with self-published literature, and spend time in the

galleries “teaching” their version. However, she also pointed out that since the exhibit on Darwin opened, they have received more compliments than complaints about it.

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

When asked for possible reasons why their museum did not have more of a focus on human evolution, one staff member responded that “human evolution is covered at natural history and anthropological museums.” This staff member also noted that “human evolution is important, and people should understand how we fit into the history of life on Earth, how we have evolved and changed over time and how we are related to other life forms.”

Ms. Valentine explains that “we do not shy away from the presentation of human evolution, but nor do we have much occasion to tell the story.” She also noted that in the future, they will likely look to augment, rather than limit, human evolution content. Although the mandate of this museum does not include educating the public on human evolution, Ms. Making states that “we do believe that it is important for museums, especially natural history museums, to tell the story of evolution as a whole. Though the topic can be controversial for some, we have a responsibility to share with the public the scientific process so they can gain a better understanding of what evolution is.”

***Presence of Key Terms and Explanations of Evolutionary Mechanisms:***

The “Changing Life” activity in one of the permanent exhibits helps explain adaptation, evolution, and common ancestry. In the Darwin exhibit, there is a video on natural selection, explaining that “*natural selection is the process by which populations of living things change, adapt, and evolve. The aspects of nature that contribute to the*

*process are variation, inheritance, selection, and time which together lead to adaptation.” A text panel explains that Darwin’s ideas did not just apply to the modern world: “fossils were seen as evidence that evolution was a natural process and had occurred in the past, and was ongoing. He concluded that all life on earth had descended, with modifications, from a common ancestor over countless generations.”*

Another topic covered was homology. Reconstructions of limb bones coupled with a text panel read:

*Darwin recognized similarities in the basic structures of different animals - a condition known as homology. He proposed that over many generations as populations of an ancestral species expand into different environments, some body structures evolve by means of natural selection, increasing the survivability of populations in new environments. For example, among mammals, the front limbs of bats, whales, horses, and humans have evolved for flying, swimming, running, and grasping, but they exhibit the same embryonic history and basic arrangement of bones - thus indicating a shared ancestry.*

Vestigial structures were also mentioned:

*genes that have lost their original functions, known as pseudogenes or junk DNA, are evidence of vestigial structures at the molecular level. The thousands of pseudogenes in humans confirm a lengthy evolutionary history. For example, the gene that allows many mammals to manufacture their own Vitamin C is a pseudogene in humans and other primates that lost this function 40mya. To stay healthy, humans must now get their Vitamin C from foods.*

The importance of understanding how evolution is related to health was raised in a text panel entitled Evolution and Medicine, and read:

*our knowledge about disease is rooted in evolution. Knowing the evolutionary basis and history of a drug resistant disease helps in the development of effective treatments. Our understanding of Human Immunodeficiency Virus (HIV) and the fight against its symptoms, Acquired Immunodeficiency Syndrome (AIDS) is a remarkable example.*

### ***Types of Displays and Evidence Presented:***

A general timeline exists as a permanent exhibit, with 3-D reconstructions explaining the geologic ages of the earth.

The Darwin exhibit included a phylogenetic tree with hominid skulls. Casts of *P. robustus*, *P. boisei*, *A. africanus*, *A. afarensis*, *H. habilis*, *H. erectus*, *H. rudolfensis*, *H. ergaster*, *H. neanderthalensis*, and *H. sapiens* were present, as well as *P. troglodytes* as a separate branch, noting the chimp/human split. A timeline at the top noted the approximate geologic timeframe in which these species existed. A text panel near the tree noted that:

*Darwin predicted that fossils of early humans would be found in the same region as our closest living relatives - chimpanzees and other apes. In the 1960s, the first specimens of Homo habilis were found in East Africa....today, a wealth of fossil and molecular data provide evidence that humans, and other great apes, descended with modification from a shared ancestral group. For example, humans and other apes share homologous features - grasping hands, mobile shoulders, and enlarged brains.*

## **IV. Museums with aspects of human evolution**

### **Fundy Geological Museum**

Ken Adams, Director/Curator, explains that while they do not deal specifically with human evolution or have exhibits on hominid evolution, they have a timeline that notes that humans evolved in Africa, and first appeared in Nova Scotia at least 13,000 years ago, following the retreat of glaciers. They also have a panel that explains the Quaternary period, where it is noted that “*climate fluctuated wildly between glaciations and warmer periods. People as we know them evolved in Africa and spread around the globe, developing agriculture and technology.*”

### ***Reasons for Not Having Permanent Exhibits on Human Evolution:***

When asked about including human evolution in museums, Mr. Adams stated, “I would consider human evolution to be one of the many stories told in the geological record. Change is constant and the study of Geology provides tantalizing clues to the vast amount of time involved in the history of the Earth. The Fossil Record also suggests that life forms have changed, and the flow of change can be seen.”

### Royal Saskatchewan Museum

Dr. Glenn Sutter, Head of Biology and Environmental Studies, has noted that while aspects of evolution are implied and not central to their exhibits, they do address the topic. The museum has mini-dioramas that show prehistoric and historic hunting methods, as well as a Time Tunnel looking at major social and technological transitions from hunting/gathering and scavenging to the information age.

However, he does feel that the museum should play a role in educating the public on human evolution: “we have a legislated mandate (the RSM Act) to be agents of social change; part of this involves helping people understand the natural history of our species and how our cultures have been shaped by, and may respond to, changing environmental conditions.” While Dr. Sutter is not aware of specific controversies at the museum, he does note that they try to avoid “any explicit reference to the ‘E’ word” [evolution].



## **V. Museums with no displays on human evolution**

### Canadian Museum of Civilization

The Museums Act (1990) established the Canadian Museum of Civilization (CMC) as a national institution responsible for preserving and promoting the heritage of Canada, and contributing to the collective memory and sense of identity of all Canadians. The CMC does not present human evolution; as one staff member has stated, “we are a human history and world civilization museum. We do not present information on the theory of evolution in our exhibits.” Another researcher at the museum noted that when the CMC and Museum of Nature were a single entity (The Museum of Man), human evolution was mentioned in the galleries. However, since the museums split, neither has had any such displays - “perhaps for the simple reason that the subject matter seems to fall between the two mandates.”

### ***Reasons for Not Having Permanent Exhibits on Human Evolution:***

Not in the current mandate.

### Canadian Museum of Nature

While the national museum of nature does acknowledge evolutionary processes in their exhibits, they do not address human evolution. A staff member explained that the Museums Act of 1990 designated the Canadian Museum of Nature (CMN) and the Canadian Museum of Civilization (CMC) as separate, independent Crown Corporations, each with different mandates. The mandate of the Museum of Nature is “to help shape and deepen the knowledge and attitudes of Canadians towards nature” (Mission and Mandate, Canadian Museum of Nature). This informant further elaborated that “the CMN became custodian of the natural history and natural science collections, while the

CMC housed all collections to do with humans and culture. Therefore, anything related to humans, including evolution, was seen as the purview of the CMC.”

The Museum of Nature had a temporary exhibit on the human genome, a critical component to human evolution. However, “the exhibit did not focus on this aspect.” This informant does believe that, in general, museums should take a leading role in educating the public on evolution, human or otherwise. She notes that, with respect to human evolution, though “... the Canadian Museum of Civilization - as the National Museum of all things human - should take the lead in teaching the science behind human evolution.”

However, she also mentioned that she is aware of the issues surrounding exhibits on human evolution. “Unfortunately human evolution exhibits tend to attract heated and public controversy, given the polarization between evolutionary and creationary viewpoints on human development. Fears that negative attention to a controversial exhibit could drive visitors away may explain why many museums shy away from human evolution exhibits.” While she supports museums as appropriate venues for presenting human evolution, she notes that they must have the collections, library resources, and trained staff to do so.

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

Not in mandate; no collections, resources or staff.

Joggins Fossil Centre

At the Joggins Fossil Centre, the aim is to present the topics specific to the region in a broader context. Dr. Melissa Grey, Curator of Palaeontology, explains that

“one of the main themes of the museum is to present geologically, palaeontologically and biologically important facts, hypotheses and theories, of which evolution is a major one - including how Joggins helped to shape ideas of evolution for Charles Darwin.”

While they do not deal with human evolution, they make a link, mentioning that the oldest known reptile was found at this site. Dr. Grey explains that “reptiles represent the branch of the evolutionary tree wherein vertebrates could live entirely on land, without needing to go back to the water to reproduce – reptiles were the first vertebrate group to make this evolutionary ‘jump,’ but this branch of the evolutionary tree also contains humans.”

While she notes that creationists regularly visit the site and enter into debates with staff members, the museum has never had any issues with funding or potential donors because of the evolutionary themes in the galleries. Dr. Grey believes that “evolution, of which human evolution is just one facet, explains the biotic world as we know it - including our presence in it. Understanding how we got here and our effect on the rest of the biotic world is critical - especially as the world is currently experiencing a biodiversity crisis.”

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

Not related to mandate.

Musée de la Nature et des Sciences

One of the curators, M. Serge Gauthier, noted that 90% of their collections are based on natural science, mainly the flora and fauna of southern Quebec. They also have a section on Quebec archaeology. He stated that while human evolution is not

addressed at the museum, it may be mentioned in a general way when it corresponds to other topics, such as the evolution of animals, or the geological history of the Earth, although it is not the main element.

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

Not in mandate; M. Gauthier suggests that “addressing human evolution is the role of anthropology museums and museums that deal with human beings.”

Nova Scotia Museum of Natural History

The permanent galleries and exhibits were designed and built in the 1970s and 1980s, and as Janet Maltby, Manager, explains, human evolution was not interpreted in the museum at that time. However, she does note that the Nova Scotia Museum provides a public venue for presenting information on topics such as human evolution. They have weekly public talks that highlight current research, and one of them included a professor from Acadia University who talked about human evolution. The Nova Scotia Museum also had a traveling exhibit in 2009 entitled *Ice Age Mammals*, part of which explored the theme of human evolution.

When asked about appropriate venues for presenting human evolution to the public, Ms. Maltby agreed that museums, through permanent and temporary exhibits, public talks and debates, and online information, are excellent forums for disseminating information. She also noted the importance of partnerships with universities and research associates, who play important roles in public education at museums.

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

Interpreting human evolution was not part of the mandate when the permanent galleries were built. However, Ms. Maltby mentioned that the Nova Scotia Museum is embarking on a project that has identified gaps in their interpretation.

Royal Alberta Museum

An informant from this museum agreed that museums should provide “unbiased, scientifically defensible information on evolution generally, including human evolution, if it is relevant to the particular message being presented.” Furthermore, “museums have an obligation to make the concept of evolution understandable to a general audience. This is particularly important when delving into the realm of human evolution where many misconceptions exist. Museums should not avoid potentially controversial issues like human evolution...but they should always be seen as a source of objective, scientifically robust information.”

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

The mandate of the Royal Alberta Museum is to tell the Alberta story. This informant has noted that “the period of human occupation in Alberta is recent so the stories include modern humans only. As such, our curators do not have specific expertise in long-term human evolution.”

Royal BC Museum

Tim Willis, Director of Exhibitions and Visitor Experience, has explained that the

mandate of the Royal B.C. Museum is to tell the human and natural story of British Columbia: “human presence here is not old enough to justify a discussion of human evolution.”

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

While Mr. Willis noted that their museum plays no formal role in educating the public on human evolution, he did state that they would entertain exhibiting a good visiting exhibit on human evolution from another museum. He also agreed that museums are the best venues for presenting information on human evolution to the public.

Royal Ontario Museum (ROM)

In the past, the ROM had a display in the Palaeontology Galleries of a family tree depicting human evolution, which was constructed in the 1960s. However, an informant at the museum noted that over time it became out of date, and was dismantled. The plan was to redo the exhibit in the new gallery.

Dr. Mark Engstrom, Deputy Director of Collections and Research, explained that when the galleries were redone, the installation on human evolution was deleted, for financial reasons. In addition, there were no hominid fossils to mount an exhibit. He noted that “rather than do it poorly, we left the topic to a new gallery of evolution which we hope to build in the future.” Dr. Engstrom does feel that educating the public on human evolution is important; “however, I believe that it needs to be done well, so that people are left with a solid grounding in the topic.” He also noted that they need a curator to keep track of new discoveries and advances in human evolution. Dr.

Engstrom has high hopes that human evolution will be covered in a future gallery, in an engaging manner, “so the public has an explanation of the process underlying the patterns of history of life they see portrayed in our palaeontology and biodiversity galleries.” While this future gallery is not currently funded, it is hoped that plans will commence within the next five years.

***Reasons for Not Having Permanent Exhibits on Human Evolution:***

Financial reasons, lack of hominid fossil materials/casts, and curator.

***Comparative Case Study: American Museum of Natural History (AMNH)***

The Mission Statement of the AMNH is “to discover, interpret, and disseminate—through scientific research and education—knowledge about human cultures, the natural world, and the universe (Mission Statement, American Museum of Natural History). The museum has a renovated, 10,000 square foot permanent exhibit dedicated to human evolution: The Spitzer Hall of Human Origins. Four sections provide background information on palaeontology and genetics, dioramas of hominid ancestors, human movement and variation, and a section that examines language, art, tool use, and music.

Dr. Rob DeSalle, co-curator, believes that public education on human evolution is “absolutely important.” He thinks that this hall is one of the most important ones in the museum: “it is one of the few halls...that addresses the process of evolution head on.” Co-curator Dr. Ian Tattersall also noted that human evolution education is “fundamental to understanding ourselves and where we fit into the natural world.” As the visitor enters the exhibit, an explanatory text is provided:

*This hall is about us - about who we are and where we come from. Although the human family originated many millions of years ago, we know a great deal about our remarkable past. In this Hall, we present scientific evidence, from fossils to genes, pertaining to the origin and evolution of the human species - the characteristics that are shared by all other life forms, and more specifically, those characteristics that make us all distinctively human.*

***Presence of Key Terms and Explanations of Evolutionary Mechanisms:***

Terms such as evolution, species, mutation, inheritance, neutral traits, drift, etc. are explained throughout the exhibits. It is noted that variation is the source of all evolutionary change, and that it comes from recombination and mutations. Neutral traits and drift are also explained, and it is noted that advantageous traits depend on the environment. In a time line with pictures of hominids, entitled “The Many Faces of Homo” it is mentioned that the “*emerging story seems to be one of evolutionary experimentation among Homo sapiens rather than gradual linear improvement.*”

***Types of Displays and Evidence Presented:***

A variety of fossil casts are used, and explanations of DNA studies and dating techniques (i.e. radiocarbon, potassium argon) are presented. It is noted that many separate lines of evidence are used to collect and interpret data. One display shows how fossils are used to look for homologous features to determine relatedness: there are limb bones from a human, chimp, and goliath frog, showing how it is the same set of bones, but in different positions.

This exhibit has state of the art dioramas, charts, videos (e.g. What is DNA?), and touch screens (such as an interactive cladogram). Dioramas of extinct hominids are extensively detailed, and also include fossil casts. For example, an exhibit on Turkana Boy (*H. ergaster*) explains how teeth and joints were used to determine his



approximate age at death. Behind a reconstruction of two Australopithecines is a reproduction of the Laetoli footprints, covered with clear plastic so that people can compare their own feet with those of the ancient hominids.

Real-life examples are used whenever possible to help explain facets of human evolution. This includes explaining how color blindness is related to the primate adaptation for night vision, how a mutation that led to the ability for adults to digest milk developed within the last ten thousand years, how the coccyx in humans shows that a common ancestor had a tail, and that light skin color likely evolved for better absorption of vitamin D in areas with limited sunlight. There is also a lab, which runs activities in evolution and genetics for students in grades eight to twelve, where they can compare fossil skulls, extract DNA, and ask scientists questions.

## **VI. Creation Science Museums**

### Big Valley Creation Science Museum

The Canadian Creation Science museum is smaller than its counterparts in the U.S. However, its message is similar. Harry Nibourg, co-owner of the museum, declared that “creationism is just another theory that gives more insight into human history. Evolution, I found out, is a theory, as is creation, but both are based on faith. Neither of us was there” (CTV, 2007).

### ***Presence of Key Terms and Explanations of Evolutionary Mechanisms:***

An exhibit on “Darwin’s Finches” talks about the creationist term “kinds.” For example, it is stated that *“the finch population today is demonstrating variation from the originally created finch kind.”* The text panel concludes with *“they [finches] have*

*faithfully reproduced 'after their own kind.' This really should not have come as a surprise to Darwin. His only earned degree was in theology, and the Bible says that is what they were created to do - reproduce 'after their own kind.'"*

To explain how common descent is invalid, a text panel called "The Failure of Homology" is used. It is explained that:

*we often see creatures with similar structures (organs, body parts, even DNA). 'Homology' is a term in biology, which means these similarities resulted from evolution. Although the wing of a bird, the leg of a horse, the flipper of a whale, and the arm of a man all have a superficial resemblance, it reveals creation according to a common plan (Designer) not descent from a common ancestor (evolution).*

There is also a wall-panel with text and a picture of a tree of life entitled: "The Ancestral Tree: How Accurate is it?" It goes on to explain that:

*'ancestral trees' are common in textbooks, and they supposedly show us all the various paths that evolution has taken as it slowly changed molecules into men. If the ancestral tree were true, we could expect the oldest fossils to be simple and 'primitive.' Complex life forms would not be found as older fossils, only as younger ones. We would also see lots of transitional forms. Contrary to evolution, we do not see a progression from simple to complex. Instead, complex life forms appear immediately in the fossil record. Nor do we see a continuous evolutionary sequence. Instead, wide gaps are everywhere, despite more than a century of digging by researchers. The evidence for evolution would be transitional fossils (like a half-bird, half-reptile or half-man, half-ape) found in their proper places in the fossil record. The ancestral tree is nothing more than wishful thinking.*

One of the last exhibits is a three-foot long reconstruction of Noah's Ark. Here, macro-evolution is mentioned. It is stated:

*God's instructions to Noah were quite clear about taking limited numbers of land animals and flying creatures, plus the eight individuals of Noah's family... Furthermore, using modern canines as an example, all dogs, coyotes, wolves, and other canines probably descended from one type of animal. Thus, we can achieve the incredible diversity we see in the animal kingdom today from a small number of animals. This is not macro-evolution, it is simply animals reproducing after their own kind, with variation within the species.*

### **Types of Displays and Evidence Presented:**

In a panel on the Evolution of Man, it is noted that:

*despite all the fanciful drawings in textbooks, there is no evidence for human evolution. According to palaeontologist Douglas Palmer, 'the trouble is we probably know more about the evolution of extinct trilobites than we do about human evolution.' In fact, there is so little evidence that evolutionists themselves cannot agree how it happened. Molecular biologists study DNA and proteins, and claim it happened a certain way. Palaeontologists study fossils, and not only do they disagree with the biologists, they argue violently among themselves as well. Creation scientists maintain that both fields of study are wrong. The Bible says that man was created in God's image. Indeed, the fossils show no support for human evolution. A. afarensis (Lucy) had traits of a chimp. Her hands and feet have been described as long and curved - designed for swinging from branches, not walking upright. Lucy is nothing more than an extinct ape. A. robustus was undoubtedly an ape. The large, sagittal crest is a give away. Humans do not have this. H. habilis was originally claimed to be half-human, half-ape - at least until limb bones were found. The limb bones were clearly ape-like, and the fossils should never have been classed in the same genus as humans. H. erectus is now considered by evolutionary experts as a category that never actually existed! Such evidence destroys the model of evolution and upholds the Biblical account of special creation.*

The last section of this panel notes that in natural history museums, the skull is often displayed with the jaw dislocated: *"this pushes the jaw forward and makes the skulls look more apelike. Why do you suppose evolutionary museums do this?"*

It is also put forth that dinosaurs and humans lived at the same time. Text and pictures are presented to show how past civilizations must have seen dinosaurs. For example, the Moche, from northern Peru, are claimed to have created vessels with dinosaurs (the museum claims it looks like a Diplodocus). There is also a Native American example of a petroglyph that is claimed to be a pterosaur. The end of the panel states that *"may we suggest, based on solid historical and scientific evidence, that flying reptiles and humans have coexisted recently?"* They then claim that *"this*

*evidence is fatal to the evolutionary dogma which has dinosaurs extinct at least 60 million years before humans evolved.”*

***Types of Displays and Evidence Presented:***

Text panels, 3-D objects, dinosaur busts, Noah’s Ark reconstruction. The museum affirms that it has only “genuine, museum quality fossils.”

***Comparative Case Study: Museum of Creation and Earth History (U.S)***

When I visited in the summer of 2010, the ICR had sold the museum to the Life and Light Foundation, a non-profit creationist organization, which is planning on expanding the museum in the near future. Upon entering the museum, a sign with the following text was displayed:

*Most museums are developed around a naturalistic interpretation of history. The Creation and Earth History Museum and its exhibits are based on true Biblical history, beginning with the creation account in Genesis 1.*

***Presence of Key Terms and Explanations of Evolutionary Mechanisms:***

Instead of common ancestry, it is explained that:

*each plant or animal type was created ‘after its kind’ as God intended and did not evolve from other kinds. Each contained the genetic controls to ensure that each would beget offspring of the same type. Each plant and animal, as well as Adam and Eve, were all created as mature, fully functional systems, not as seeds or eggs or infants.*

Deep time and the changing environment of Earth is explained by the Global Flood, which left in its wake “*many evidences in the form of great beds of fossils. These evidences have been mistakenly ascribed by evolutionists to long geological ages during which plants and animals were supposedly evolving from primeval one celled organisms into the complex biosphere of today.*”

### ***Types of Displays and Evidence Presented:***

When entering the time tunnel of Creation, the exhibit notes that the creation of the earth *“must have been fairly recent, about 6-10 thousand years ago. There are no firmly documented historical records older than this.”* The fossil record is not seen as evidence for evolution, but rather *“the billions of fossils of both men or animals... speak of sin and death, not the evolution of life.”*

The Day 6 of Creation exhibit is focused on Man and Woman, created in the “image of God,” made uniquely different from the animals. To reconcile the hominid fossil record with Biblical accounts, there is an exhibit on “Human Fossils and Post Flood Man.” They use the examples of “Neanderthal man,” noting that:

*he seems to have been a short, thick set muscular individual with large hands and feet and a body not unlike that of cold-adapted modern man (Eskimo). This would be consistent with humans that lived during the Ice Age (period after Flood and Tower of Babel). Many Neanderthal features are similar to those in elderly humans today. Since humans lived to great ages in the initial generations after the Flood and Babel perhaps the features are primarily due to advanced age.*

Another section has a reconstruction of the Laetoli footprints, along with this text:

*According to the evolutionists, the age of the volcanic layer was 3.7 mya, and modern man is supposed to have evolved only in the last few hundred thousand years. This is an instance where the obvious interpretation - namely, that the tracks were made by man - was not accepted. Instead, a hypothetical animal with human-like feet was constructed because it fit with preconceived evolutionary thinking.*

### **Creationist vs. Science-Based Museums**

Comparing displays and exhibits at creationist museums and traditional science-based museums is an interesting way to observe how both venues approach public

education. It was observed that both types of museums include timelines for visitors to walk through, reconstructions and dioramas, pictures and diagrams, and videos. Both also use fossils, or casts of fossils, as evidence. While the methods are the same, there are obvious differences in the messages and evidence being presented. When Susan Harding visited the creationist Museum of Earth and Life History (now closed), she later reflected that it was an “anti-museum of natural history” (Harding 2000, p. 221). This is an apt description of creation science museums. In general, they take scientific evidence out of context and present their own interpretation that fits with the Biblical account of creation. The examples below illustrate how similar concepts may be addressed from very different perspectives.

### **Evolutionary Terms**

Natural Selection is an evolutionary concept that is present in both science-based and creationist museums. The Royal Tyrrell, for example, defines natural selection as *“the process by which populations of living things change, adapt, and evolve. The aspects of nature that contribute to the process are variation, inheritance, selection, and time which together lead to adaptation.”* The Manitoba Museum explains that *“each succeeding generation is produced by the few successful individuals which happen to be better adjusted to the present environment. A change in the hereditary characters of the species has resulted through a natural selective process.”*

While the creationist museum uses scientific vocabulary, mainly to state how evolutionary concepts are wrong or unsupported, they also use their own terms, such as “kinds.” While the Big Valley Creation Science Museum does not specifically define

“kinds,” they do note that *“ten times in the first chapter of the book of Genesis, it is stated that God created things to reproduce after their own kinds.”* This means that all genetic information must have been present in the originally created kind; no new genetic information can be acquired. However, they claim that speciation “within kinds” may take place. For example, in the Noah’s Ark exhibit, it is explained that dogs, coyotes, and wolves probably descended from one type of animal. While it is well-known that dogs are descended from wolves, the Big Valley Museum does not address aspects such as the time required for speciation to take place.

## **Homology**

In the example of homology and common ancestry, both science-based and creationist museums agree that there are structural similarities among organisms. The Royal Tyrrell explains that similarities in the basic structures of different animals (i.e. bats, whales, horses, and humans) is an example of shared ancestry. They also provide examples of homologous features among humans and other great apes, such as grasping hands, mobile shoulders, and enlarged brains.

The Big Valley Creation Science Museum explains that “homology” is a term used in biology that means *“similarities resulted from evolution.”* They then go on to state why this is wrong: *“although the wing of a bird, the leg of a horse, the flipper of a whale, and the arm of a man all have a superficial resemblance, it reveals creation according to a common plan (Designer) not descent from a common ancestor (evolution).”* While both the Royal Tyrrell and Big Valley mention homology, the science-based museum explains it as a result of common ancestry, while the creationist museum claims that it reveals creation by a Designer.

## Human Evolution

The Manitoba Museum has four fossil casts in their display on human evolution, noting the approximate time period for each species. The Redpath Museum display contains ten hominid casts, as well as a timeline of when they lived. The special exhibit on Darwin at the Royal Tyrrell contained a display with a phylogenetic tree made with eleven hominid cranial casts, and also contained a cranial cast of *P. troglodytes* as separate branch, noting the chimp/human split.

The Big Valley Creation Science Museum notes that *“despite all the fanciful drawings in textbooks, there is no evidence for human evolution. The Bible says that man was created in God’s image.”* While they mention several hominids, it is only to show that they are “extinct apes” and not true humans.

When presenting human evolution, science-based museums always display casts of the fossil evidence. The Big Valley Museum does not include any fossils, trusting that the visitor will take their word that there is no evidence for human evolution. Their exhibits explicitly state that human evolution is unsupported, and claims such as *“Lucy’s hands and feet were designed for swinging from branches, not walking upright; A. robustus had a large sagittal crest, which humans do not have”* are not explained or provided with any context. Because they rely on the Bible as their scientific foundation, the visitor must rely on his or her faith when deciding whether or not to believe what the Big Valley Museum is teaching.

The Museum of Creation and Earth History in California addressed the fossil evidence in a similar manner. They explained that, *“after Babel, the different tribes quickly scattered around the world. Each group was small at first, and had to survive by*



*hunting and gathering (also known as Stone Age culture).”* They also stated that Neanderthals were probably elderly modern humans. It is claimed that:

*there are no fossils of Australopithecus or of any other primate stock in the proper time period to serve as evolutionary ancestors to humans. When humans first appear in the fossil record they are already human. This is compatible with the concept of special creation.*

Fossil remains must therefore be classified as either of “moderns” or of apes, as transitional species cannot have existed.

#### **Section IV: Synthesis and Recommendations**

It was stated in the introduction that there were three main research objectives for this project:

- 1) Determine which Canadian museums had exhibits on human evolution;
- 2) Investigate the possible reasons behind the decision to include or omit human evolution from exhibits;
- 3) Observe the messages and displays of the Canadian Creation Science Museum and compare them to science-based museums.

#### **Results:**

1) Out of the participating Canadian museums, two had permanent exhibits on human evolution (Manitoba Museum and the Redpath Museum). The University of Alberta’s Department of Anthropology had a permanent exhibit, in a public hallway, that addressed human evolution. No national museums addressed this topic. It appears that university-affiliated museums are more likely to incorporate human evolution, as seen not only in the Redpath, which has its own building, but also at the Universities of

Alberta, Winnipeg, and Simon Fraser. The Yale Peabody Museum was provided as a case study for a university-affiliated museum that chose to dedicate a large portion of gallery space for an extensive exhibit on human evolution.

2) Reasons why human evolution was not included in exhibits:

- 1) Not in mandate
- 2) Possible controversy
- 3) Human presence in region not old enough to justify discussion of human evolution
- 4) No curators/staff in this area
- 5) Financial limitations
- 6) Lack of display material (hominid fossil material/casts)
- 7) It is covered at other museums

Participants were asked where the public should go to inform themselves on this topic. All answered that museums are the best venue for this, especially natural history and anthropology museums.

3) While creation science museums appear to be similar to science museums on the surface, their interpretations of the evidence are unverifiable and based on Biblical accounts. The consequence of this is that their claims cannot be tested, and therefore what they claim to be “science” is, in reality, faith.

The growing presence of creationist museums is an interesting phenomenon. As the public seems to consider museums in general to be trustworthy, credible sources of information, creationists have imitated the basic infrastructure and design of museums, but incorporated their own religious explanations. In today’s society, people are more likely to question things, and ask for “proof”; through creation science museums, it is

possible for creationists to affirm their intangible beliefs through the medium of museums.

Duncan (2009) has also drawn attention to the fact that in these privately funded museums, scientists or the government cannot intervene. Therefore, while creationists may not have won the right to teach creationism in the classroom, their claims can be displayed, unchallenged, in their museums.

## **Recommendations**

Based on the responses from the participants in this study, several points related to including human evolution in exhibits are provided below.

### *1) Focus on the positive aspects of incorporating human evolution.*

Staff members at museums with exhibits on human evolution have generally received more positive than negative feedback from visitors. For example, Kathryn Valentine (Royal Tyrrell) pointed out that their special exhibit on Darwin received more compliments than complaints. The Anthropology Department at the University of Alberta also had positive feedback on their human evolution exhibits, as did the museum at Simon Fraser when they presented their temporary exhibit. Therefore, the benefits of creating interesting and educational exhibits on human evolution may outweigh the costs, such as the possibility of controversy.

The majority of survey respondents stressed the importance of human evolution as a scientific topic, mentioning that it was “of vital importance” and that “people should understand how we fit into the history of life on Earth, how we have evolved and changed over time and how we are related to other life forms.” It was also noted that

while the topic may be controversial, museums still have a responsibility to help make evolution, including human evolution, understandable to the public.

### *2) Include both regional history and human evolution*

While it is very important for regional museums to tell the story of their area, human evolution may also be incorporated, as it tells the evolutionary story of all human beings, regardless of cultural affiliation or geographic origin. Although the creationist museum in Alberta is small, it has more references to human evolution, albeit all references to why it cannot have taken place, than most of Canada's natural history museums.

While many museums claim that human evolution does not fall within their mandate, comparative case studies with the American Museum of Natural History and the Yale Peabody Museum demonstrate that human evolution can be integrated into museums that deal with anthropology or natural history. Several participants thought that it was unnecessary to address human evolution, as it was covered at other museums. However, it is clear that this is not the case, and more museums should consider implementing human evolution into their exhibits.

### *3) Incorporate evolutionary mechanisms into exhibits on human evolution*

Human evolution exhibits may also be useful for introducing basic evolutionary concepts, and explaining how they are used in reconstructing the evolutionary history of humans. By explaining key evolutionary terms in human evolution exhibits, museums may reinforce learning. For example, several museums illustrate homology by including human limb bones. An exhibit on vestigial structures would likely be very interesting for

visitors, as they can use their own knowledge of their bodies to understand ancestral traits, such as the tailbone. Another example, discussed in Section I, was explaining natural selection using antibiotic resistance.

#### *4) Use fossil casts*

Several museums mentioned that they could not produce exhibits on human evolution because they lacked hominid fossils. However, the majority of museums world-wide that exhibit human evolution use casts and reconstructions. Original hominid fossils are far too rare and fragile. Many will recall the controversy over “Lucy” (*A. afarensis*) leaving the museum in Ethiopia as part of a traveling exhibit. Even at the Ethiopian museum, the original is locked in a vault, and a cast is on display (Beaubien, 2007). Because of the fragility and rarity of hominid fossils, good-quality casts are an integral component of human evolution exhibits. It is also very effective to have three-dimensional reconstructions based on the fossil evidence, in the form of dioramas. The AMNH does this effectively, by displaying casts of hominid remains beside a reconstruction.

### **Conclusion**

Given that evolution is fundamental to biology, and understanding human evolution is equally important to understanding what it means to be human, it is surprising that only two Canadian museums had permanent exhibits that addressed human evolution. The possible reasons given by respective museum staff to omit human evolution from exhibits include human evolution not being present in the

mandate, possibly controversy, no curators in the area of human evolution, financial limitations, lack of display material, and being supposedly covered at other museums.

In addition to the lack of human evolution in Canadian science museums is the Canadian creationist museum claiming that “there is no evidence for human evolution.” While both types of museums are similar in terms of their infrastructure and the general topics covered in displays, they interpret the evidence in entirely different ways; creationist museums are faith-based, while science museums contain evidence based on testable scientific theories.

Evolutionary illiteracy and opposition to evolution are present in Canada, so more museums should consider taking an active role in educating the public about this topic. While the creationist museum may claim that there is no evidence for human evolution, science-based museums can incorporate evidence into their displays to show that yes, there is fascinating evidence for human evolution, from fossils to DNA studies, and it can be made applicable, and understandable, to every human being.

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