



The Special Challenge of Exhibits on Evolution

How Visitors Perceive Exhibits on Evolution in
U.S. Science and Natural History Museums

Angus Carroll

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Angus Carroll, October 2016

Although the concept of evolution is a fundamental cornerstone of modern biology—accepted by over 98% of working scientists¹—many Americans do not believe in evolution in any form.²

Unfortunately, it is almost impossible for a natural history museum or science center to put on an exhibit that deals with biology, zoology or paleontology without supporting—if only indirectly—the concept of evolution. Even dinosaurs (evidence of an old Earth, proof of extinction, and universally considered—and usually presented as—ancestors to modern birds), imply evolution.

For science museums and science centers this poses a challenge: How to present evolution in a way that is scientifically accurate and educational but does not offend visitors' religious beliefs.

Visitor Self-selection

Research indicates that the vast majority of visitors to natural history museums and science museums believe in evolution.³ More importantly, most visitors believe museums should feature exhibitions on evolution, and in one survey 84% said they were interested in bringing their children to an exhibit on evolution.⁴

A Florida Museum of Natural History study revealed 89% of visitors believed in evolution while only 11% partially or fully rejected evolution.⁵

A visitor survey at a California Academy of Sciences exhibit on “Lucy” found 78% of visitors rated learning about human evolution a four or a five on a five-point scale.⁶

¹ Masci, D., [On Darwin Day, 5 Facts about the Evolution Debate](#). Pew Research Center. February 12, 2016. 98% of scientists connected to the American Association for the Advancement of Science believe in evolution.

² [Gallup Poll, June 2, 2014](#). Polls continue to show a significant percentage of Americans (42%) do not believe in evolution.

³ Spiegel, A., Evans, M., Gram, W., Diamond, J. [Museum Visitors' Understanding of Evolution](#). Educational Psychology Papers and Publications. Paper 194. 2006.

⁴ Stein, J., Storksdieck, M. [What They Bring With Them: Museum Visitors' Perspectives on Evolution](#). ASTC Dimensions, 2006.

⁵ MacFadden, B., Dunckel, W., Ellis, S., Diekring, L., Abraham-Silver, L., Kisiel, J., Koke, J. [Natural History Museum Visitors' Understanding of Evolution](#). Bioscience, Vol. 57, No. 10. November 2007.

⁶ Squire, J., Hubbell Mackinney, L. Learning from Lucy: What visitors want to know about human evolution. An evaluation study of the Lucy skeleton in the “Creatures of the Ice Age” exhibit. San Francisco, CA. California Academy of Sciences. 1996.



PHOTO: Wikipedia Commons

The T. rex Sue at the Field Museum in Chicago. Even dinosaurs imply evolution. Most visitors to science or natural history museums, it turns out, either believe in evolution or are open to learning about it.

This indicates visitor populations are self-selecting. In other words, the very nature of a natural history museum or science museum attracts visitors predisposed to believe in evolution, or at least visitors who are open to learning about it.

Indeed, focus groups have shown that most visitors want to learn more about evolution. In 2002, the University of Pennsylvania undertook a series of focus groups to plan for an exhibit on human evolution called *Being Human: A Design in Process*.⁷

All but three of the 46 participants indicated they would go to an exhibit on evolution (all three who declined did so for logistical reasons, not because of religious beliefs).

This means exhibits on evolution (or that cover or imply evolution):

- Will not deter potential visitors who do not believe in evolution because that bias is already built into the visitor population.
- Will appeal to the majority of visitors.
- Are unlikely to cause controversy.

⁷ Broun, M. [Being Human: A Design in Process, Four Focus Groups](#). University of Pennsylvania Museum, Museum Solutions. 2002. The four groups were: adults, parents, kids, and teachers.

Stick to the Facts

Nevertheless, even if the visitor population as a whole is predisposed to believe in evolution, that does not mean every visitor will be.

Virtually all experts agree that museum staff should stick to the facts and not engage in the evolution/Creationist debate.

This means museum staff (especially docents) should be trained to deal with Creationists and Creationist questions, regardless of how unlikely it is they will be required to so.

Questions are the easy part. For example, people often ask, “Isn’t evolution just a theory?”

The correct answer to this question is simple and straightforward: “Evolution is much more than “just a theory,” in the way that phrase is typically used. It is a *scientific theory*. That means it has been substantiated by a large body of facts and scientific observations, that there is no other scientific explanation that better fits the facts and observations, and that virtually all scientists (>98%) believe it is true and use it as the framework for their research.”

For many questions there are short, easy-to-understand answers like the one above, but there are also questions too complicated to be answered quickly (i.e., during a tour),

and in that case museum staff should refer visitors to other sources.

For example, if a visitor points out that the fossil record does not support evolution, museum staff might say, “That’s a good point. The fossil record is sketchy—fossils are only preserved in extraordinary circumstances. A good book on the subject is *Written in Stone* by Brian Switek. His book provides an overview of the fossil record and the problems it presents.”

More difficult than specific questions (which are most often genuine), are specific people, looking to challenge evolution.

Although this is rare (at the Darwin & Dinosaurs exhibit in Jacksonville, Florida, an exhibit that explicitly addresses evolution—in a politically conservative area—it did not come up once in over three months),⁸ museum staff should be prepared, especially when giving guided tours.

Guidelines that should always be followed :

- Always be respectful and listen to what visitors have to say.
- If you do not know the answer, say so.
- Do not engage in the evolution/Creationist debate.
- Do not make light of or criticize Creationism or Creationists.
- Point out you are a science museum and that is why only the scientific perspective is presented.

⁸ Darwin & Dinosaurs ran at the Museum of Science & History, Jacksonville, Florida, from May 27 to September 5, 2016. During that time 146 comment cards were filled out by exhibit visitors. Only two questioned evolution. A complete report on the feedback can be found here: [Comments by Visitors: Darwin & Dinosaurs Exhibit](#). September 12, 2016.

Statement on Evolution

Science Museum of Minnesota

The Science Museum of Minnesota is committed to presenting the most scientifically sound principles in our exhibits, educational programs, and films. Therefore, throughout the museum and in our classes, we practice and encourage the teaching of evolution as fundamental to the teaching of sound science and critical thinking.

The theory of evolution is grounded in well-substantiated, testable hypotheses that have stood the tests of time and peer review. The word “theory” as it is used here, does not mean a mere speculation or a best guess. Rather, in referring to a scientific theory, it is a set of firmly established scientific principles supported by research. Evolutionary theory serves as a foundation for natural history including the museum’s core competencies in paleontology, anthropology, and biology.

To compromise the explanations of evolution or to permit unscientific alternative explanations into our galleries or our programs would misrepresent the principles of science.

We will continue to provide the best available research and exhibits that have made us a trusted science resource for nearly a century.

The Museum of the Earth, Ithaca, NY, has published a Guide for Museum Docents on evolution and Creationism that provides background on these subjects, answers to frequently asked questions, and strategies docents can use if and when they encounter problematic visitors.¹⁰

Perhaps the most important guideline is to be respectful. Staff should listen to the person’s questions/statements. If it is possible to provide a simple, fact-based response, staff should do so. Staff should not argue with visitors, nor engage in a debate about whether the evolutionary or Creationist viewpoint better explains the facts.

If a visitor insists that evolution is wrong, staff should point out that evolution is—at the present time—the best scientific explanation we have to explain the diversity of life on Earth, and that is why the museum is hosting the exhibit.

The museum itself can play an important role in both heading off Creationist challenges and supporting staff by publishing a Position on Evolution.

This may not be practical for all museums, but for many science and natural history museums it establishes an institutional position that supports staff and confirms the organization’s commitment to science.

¹⁰ Evolution and Creationism: A Guide for Museum Docents. Museum of the Earth, Ithaca, NY. 2005.

A good example is the Science Museum of Minnesota. They publish a *Statement on Evolution* on their website.

Many other museums have similar statements,¹¹ as do many other educational organizations including science academies, teacher associations, universities, boards of education, and government agencies. Explicit statements of support for evolution empower staff as representatives of the museum's official position.

Are Museum Exhibits Effective at Teaching Evolution?

Lost in the concern over controversy is perhaps the most important question of all: Do museum exhibits on evolution work? Do they result in demonstrable learning?

Fortunately, there is hard data on this question and the answer is “Yes.” In 2012, researchers undertook an in-depth study of museum visitors to determine if—in a single visit to a museum—they demonstrated specific learning as a result of an exhibition on evolution.^{12, 13}

The study focused on “Explore Evolution,” an exhibit designed by the National Science Foundation to increase public understanding of evolution, installed at five Midwest museums.

The exhibit illustrated the mechanisms of evolution through a number of interactive

projects, including the rapid evolution of HIV, changes in Galápagos finch populations, and the genetic links between humans and chimpanzees.

In all cases and across all age groups, participants showed a noticeable gain in the understanding of key terms, evolutionary mechanisms, and evolutionary reasoning. Over 90% of participants demonstrated measurable learning gains.

In 2005, a major exhibit called “Darwin” was created to celebrate the anniversary of his birth (1809) and the publication of his major work, *On the Origin of Species* (1859). It ran from 2005 to 2009.

It first opened at the American Museum of Natural History in New York. Visitor surveys there showed that three out of four visitors said they understood evolution better after the exhibit. (Over 90% said they agreed with the basic tenets of modern evolutionary theory, and the average score for the exhibit was 8.5 out of 10. Only two of more than 300 visitors interviewed indicated they did not believe in evolution.)¹⁴

These results clearly indicate that not only are most visitors to science and natural history museums interested in learning about evolution, but that most visitors do—museum exhibits are an effective way to inform the public about evolution, quite possibly the best way given their collections and other resources.

¹¹ See [Manchester](#), [Carnegie](#), [Smithsonian](#), for additional examples.

¹² Spiegel, A., Evans, M., Frazier, B., Hazel, A., Tare, M., Gram, W., Diamond, J. [Changing Museum Visitors' Conceptions of Evolution](#). Educational Psychology Papers and Publications, Paper 187. 2012.

¹³ Rosengren, K., Brem, S., Evans, M., Sinatra, G., Eds. [Evolution Challenges: Integrating Research and Practice in Teaching and Learning About Evolution](#). Oxford University Press, 2012.

¹⁴ Giusti, E. [Darwin: A Summative Evaluation of the Visitor Experience](#). March 2006.

Summary

A solid grasp of evolution is essential to understanding the world we live in. Indeed, many of today's most pressing scientific and social challenges have evolutionary causes and effects from antibiotic-resistant microbes to climate change, and an educated public is critical to forging informed public policy.

Given the important role museums play in public education (tens of millions of people visit science and natural history museums every year in the U.S.), exhibits on evolution—if done correctly—can contribute enormously to the public good.

And the help is needed. Although evolution is officially part of the K12 science curriculum, it is not always taught, or taught well, in the public school system.¹⁵

Research on museum visitors has revealed a number of important facts that work in favor of such exhibitions and show why they should be a priority for museums and science centers:

- Visitors self-select and most visitors to science or natural history museums believe in, or are open to, the concept of evolution.
- Infrequently as it is likely to occur, there are strategies to deal respectfully with visitors whose beliefs run counter to evolution.
- Museum exhibits are an effective way to educate the public on evolution and it is badly needed (although most visitors believe in evolution, they have a poor grasp of the mechanics and harbor a number of serious misconceptions).

Although the evolution/Creationist debate will continue for the foreseeable future, science and natural history museums can play an important part in the—evolving—dialog.

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Discussion Paper

This discussion paper has been created to summarize the research on this issue.

Surprisingly, a significant number of academic studies have been undertaken in this area and the results published in numerous journals. Unfortunately, the research is scattered and unconnected.

This paper attempts to present an overview of the main findings.

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¹⁵ Keep, S., [Still Fighting for Evolution](#). Nova Education, Science of Learning, December 1, 2015.