

Feature *WWW.Life Sciences Education*

Darwin on the Web: Resources for Darwin 200 and Beyond

Louisa A. Stark

Genetic Science Learning Center, University of Utah, Salt Lake City, UT 84112-5330

INTRODUCTION

Charles Darwin's theory of evolution by natural selection transformed many fields of science and is key to modern biology. The year 2009 has been designated as "Darwin 200," commemorating the bicentenary of Darwin's birth on February 12, 1809, and the 150th anniversary of the publication of his seminal work, *On the Origin of Species*, on November 24, 1859. This Feature explores online resources about Darwin and his work that can be used at the secondary and undergraduate levels.

A DARWIN EXHIBIT ONLINE

In preparation for Darwin 200, the American Museum of Natural History (AMNH) in New York City developed an exhibit on Charles Darwin and his life. The exhibit was organized in collaboration with the Museum of Science, Boston, MA; The Field Museum, Chicago, IL; the Royal Ontario Museum, Toronto, ON, Canada; and the Natural History Museum, London, England. As a companion to the exhibit, the AMNH developed an excellent website on Darwin's life and work as well as his impact on contemporary biology (www.amnh.org/exhibitions/darwin/; Figure 1).

The site content is presented in an engaging manner, told as a story with photographs, images, videos, and audio files; you must have the free RealPlayer software installed to play the latter two formats (www.realplayer.com/realplayer.html?pageid=404Page&pageregion=main&src=404_404_index.html&pcode=rn&opage=404_404_index.html). To build a sense of Darwin's thinking as he built his theory of evolution by natural selection, I particularly liked how the materials combined examples of living species, fossil specimens, and geology along with questions Darwin asked.

An introductory video titled, "The Inside View," is linked from the homepage of the site. Seven scientists from the AMNH and other institutions talk about the importance of Darwin's theory of evolution to their research today. Examples of each scientist's study organisms, materials, or both are shown as each one briefly describes the theory's implications

for his or her research. The video demonstrates the breadth of Darwin's influence, from ichthyology through entomology, evolutionary biology and paleontology, to astrophysics. This 4:36-minute video could be used as an engaging opener to a class discussion on Darwin's theory of evolution.

Major sections of the site include Introduction, The World Before Darwin, Young Naturalist, A Trip Around the World, The Idea Takes Shape, A Life's Work, Evolution Today, and Endless Forms Most Beautiful. Each section includes 1–12 subsections that elaborate on these topics.

In addition to the introductory video, the site includes several other audio and video clips. The simulated soundscape from the Beagle voyage could be used to set the stage as students enter the classroom (6.46 minutes, accessed from A Trip Around the World). A 2.17-minute video tour of Darwin's home, Down House, enables visitors to see some of the rooms in which he worked (accessed from A Life's Work). It was particularly exciting to see several specimens he had collected and labeled in his own hand. Another video in this section shows the Sandwalk, where Darwin took a daily walk at noon (2.58-minute video, accessed from "A Day in the Life" subsection). However, narration for these two videos would have made them more powerful. The Evolution Today section also includes several videos. Time-lapse photography vividly illustrates the evolutionary relationship of development in zebrafish, chicken, and pig (55 seconds, accessed from the "How Do We Know Living Things Are Related?" subsection). In the "What Is A Theory?" video, five prominent scientists discuss scientific theories and their role in science (1.54 minutes, in the "What Is A Theory?" subsection). This video is particularly important because many who do not accept evolution focus on the word "theory" to imply evolution is speculation rather than an accepted principle. In the "Scientists on Faith" video, seven individuals, including Francis Collins, discuss the intersection of faith and evolution (4.48 minutes, in the "Social Responses" subsection). This video addresses topics that frequently arise when evolution and religion are addressed together and could fruitfully be used in classes to stimulate a more informed discussion.

The Educator's Guide, accessed from the homepage, was designed primarily as a guide for school visits to the physical exhibit. However, it includes some content instructors could use as well as links to sites with resources for teaching evolution.

DOI: 10.1187/cbe.08-12-0078

Address correspondence to: Louisa A. Stark (louisa.stark@utah.edu).

MOCKINGBIRDS NOT FINCHES

For many years, textbooks have focused on differences among the beaks of finch species that Darwin saw and collected in the Galápagos Islands, as inspiration for development of his theory of evolution. However, it was mockingbirds that really started Darwin thinking about differences among related species and how these might have arisen. He observed that the differences between birds on four, geographically close islands were greater than the differences he had seen in all of South America. His key insight that species might change once they were physically isolated led to his revolutionary idea of evolution by natural selection.

Two websites provide information about Darwin's mockingbirds. The mockingbird page on the Natural History Museum in London site has a 6.47-minute video (www.nhm.ac.uk/about-us/news/2008/november/darwins-mockingbirds-knock-finches-off-perch.html). It includes live footage of the birds, examples of specimens Darwin collected, a discussion of Darwin's notes about the birds, and a description of how these historical specimens are being used in a conservation biology effort to restore one of the species to an island on which they became extinct in ~1880.

The Darwin's Mockingbirds site (<http://oikos.villanova.edu/Nesomimus/index.html>; Figure 2) provides more extensive information about these species. It includes photo-

AMERICAN MUSEUM OF NATURAL HISTORY

ON EXHIBIT PUBLIC PROGRAMS PLAN YOUR VISIT SCIENCE EDUCATION SUPPORT AMNH KIDS & FAMILIES TICKETS SHOP SEARCH

NOVEMBER 19, 2005 - AUGUST 20, 2006

DARWIN

DISCOVER THE MAN AND THE REVOLUTIONARY THEORY THAT CHANGED THE COURSE OF SCIENCE AND SOCIETY

Featuring live GALAPAGOS TORTOISES, IGUANA, and FROGS!

- Introduction
- The World Before Darwin
- Young Naturalist
- A Trip Around the World
- The Idea Takes Shape
- A Life's Work
- Evolution Today
- Endless Forms Most Beautiful
- Meet the Curator
- Behind the Scenes

Watch Darwin Video

Visitor Information Public Programs Darwin Resources Educator's Guide Collaborators Shop Credits

Darwin is organized by the American Museum of Natural History, New York, in collaboration with the Museum of Science, Boston; The Field Museum, Chicago; the Royal Ontario Museum, Toronto, Canada; and the Natural History Museum, London, England.

The American Museum of Natural History gratefully acknowledges **The Howard Phipps Foundation** for its leadership support. Significant support for *Darwin* has also been provided by Chris and Sharon Davis, Bill and Leslie Miller, the Austin Hearst Foundation, Jack and Susan Rudin, and Rosalind P. Walter. Additional funding provided by the Carnegie Corporation of New York, Dr. Linda K. Jacobs, and The New York Community Trust—Wallace Special Projects Fund.

The videos on this site use Real Player. [Download Real Player.](#)

SEARCH | SITE MAP | FAQ | COPYRIGHT INFO | PRIVACY POLICY | ROSE CENTER | CONTACT US | SIGN UP FOR AMNH ENOTES

Central Park West and 79th Street, New York, NY, 10024-5192

Figure 1. The AMNH's online companion to the Darwin exhibit provides a wealth of information about Darwin's life and work as well as their implications for modern science.

graphs and descriptions of each Galápagos species as well as their mainland relatives. There is also a collection of quotes about mockingbirds from Darwin's writings. The site was developed by Robert L. Curry, who conducted field studies on the birds, and is currently in the Department of Biology at Villanova University in Villanova, PA.

Cambridge, England, has undertaken the massive project of making Darwin's written works available to anyone with Internet access (<http://darwin-online.org.uk>; Figure 3). The site says it includes "Darwin's complete publications, 20,000 private papers, the largest Darwin bibliography, manuscript catalogue and hundreds of supplementary works: specimens, biographies, obituaries, reviews, reference works and much more." Editorial introductions assist visitors in understanding the context for a particular work or set of works.

DARWIN'S COMPLETE WORKS ONLINE

The Complete Work of Charles Darwin Online project, directed by John van Wyhe at the University of Cambridge in

Materials are available as scanned images of the original as well as searchable text and PDFs. Handwritten materials

Galápagos Mockingbirds

[Home](#)

[The sub-genus *Nesomimus*](#)

[The archipelago and its mockingbirds](#)

> Galápagos Mockingbird

[Subspecies](#)

[Floreana Mockingbird](#)

[Española Mockingbird](#)

[San Cristóbal Mockingbird](#)

[Darwin and mockingbirds](#)

[Mainland relatives](#)

[Nesomimus bibliography](#)

[About this site](#)

<http://oikos.villanova.edu/nesomimus/>

Created by Robert L. Curry

Last modified: Fri, Sep 12, 2008



Galápagos Mockingbird

Mimus parvulus

[Subspecies](#)

- Most widespread of the mockingbirds in Galápagos: lives on all major islands except those islands and adjacent islets currently or formerly inhabited by one of the other 3 species (Española, San Cristóbal, Floreana) and also absent from Pinzón
- Size varies among several subspecies; includes smallest mockingbirds in the archipelago
- **Cooperative breeder** on most islands: non-breeders act as helpers at nests in their group's territory, and some breeders help raise nestlings in nests other than their own
- Social system and demography studied intensively on Isla Genovesa by R. L. Curry, P. R. Grant, M. F. Kinnaird, and N. Grant, 1978-1990



Subordinate begging behavior by juvenile Galápagos Mockingbird on Isla Genovesa



Hatchling Galápagos Mockingbird on Isla Genovesa

[Back to Top](#)

Figure 2. Robert Curry's site, Darwin's Mockingbirds, provides extensive information on each bird as well as excerpts from Darwin's writings about them.

are shown as images, side-by-side with transcriptions. I particularly enjoyed exploring Darwin's field notebooks from his Beagle voyage (Figure 3), seeing his handwriting and sketches. More than 1000 illustrations are contained in works on the site; many are collected in the Illustrations section.

If you would like to listen to Darwin's works as you commute or work out, you can download free audio files to play on your mp3 player. For example, the first edition of *On the Origin of Species* is contained in 21 files. Most of the audio files on the site were created using text-to-speech software, which sounded better than I expected.

The Complete Work of Charles Darwin Online
 Publications | Manuscripts | Biography | Credits | Search: [Advanced search](#)

< Back 36 Next > Switch to: [Text view](#) [Image view](#)

36

I think
[sketch]

Case must be that one generation then should be as many living as now. To do this & to have many species in same genus (as is) requires extinction.

Thus between A & B immense gap of relation. C & B the finest gradation, B & D rather greater distinction. Thus genera would be formed. — bearing relation

37

to ancient types. — with several extinct forms for if each species an ancient (1) is capable of making 13 recent forms, twelve of the contemporaries must have left no offspring at all, so as to keep number of species constant. —

With respect to extinction we can easily see that variety of ostrich, Petise may not be well adapted, and thus perish out, or on other hand like Orpheus being favourable

38

many might be produced. — This requires principle that the permanent varieties produced by inter confined breeding & changing circumstances are continued & produced according to the adaptation of such circumstances, & therefore that death of species is a consequence (contrary to what would appear from America)

39

of non-adaptation of circumstances. — Vide two, pages back.

Diagram

The largeness of present genera renders it probable that the many contemporary, would have left scarcely any types of their existence in the present world. — or we may suppose only each species in each generation only breeds; like individuals in a country not rapidly increasing. —

40

If we thus go very far back to look to the source of the Mammalian type of organization; it is extremely improbable that any of his relatives shall likewise the successors of his relations shall now exist — In same manner, if we take a man from any large family of 12 brothers & sisters in a state which does not increase

41

it will be chances against any one of them having progeny living ten thousand years hence; because at present day many are relatives, so that by tracing back the descent fathers would be reduced to small percentage. — & in therefore the chances are excessively great against any two of the 12. having progeny after that distant period. —

42

Hence if this is true, that the greater the groups the greater the gaps (or solutions of continuous structure) between them. — for instance, there would be great gap between birds and mammalia, Still greater between

Figure 3. The Complete Work of Charles Darwin Online provides access to thousands of materials, including this image of a page from one of Darwin's notebooks.

THE DARWIN CORRESPONDENCE PROJECT

The Darwin Correspondence Project (www.darwinproject.ac.uk/; Figure 4) was founded in 1974 as a cross-Atlantic collaboration between the American scholar Frederick Burkhardt and University of Cambridge zoologist Sydney Smith. The site includes letters Darwin wrote as well as letters he received. On the homepage, a Daily Quote links to the full text of a letter.

The “Explore the Letters” subsection (accessed from the About the Letters section) provides links to “a few selected letters—some famous, some fun.” Topics include childhood, the Beagle voyage, family life, health, and evolution. A brief introduction to each letter provides background information, context, or both. A quote piques the visitor’s interest to explore the link to the transcript of the complete letter. One quote that caught my eye comes from a letter Darwin wrote to a friend shortly before he set sail on the *Beagle*: “The scheme is a most magnificent one. We spend ~2 years in S America, the rest of time larking round the world.” An Advanced Search allows one to search the database for letters that include specific words. For example, “finch” yielded 37 results. A brief summary or the part of the sentence containing the word is supplied for each letter.

One section of the site explores Darwin and Religion. It includes a video (58.14 minutes) of interviews with two University of Cambridge faculty members discussing topics related to the role of Darwin in modern science. Two excerpts from this longer video are also available: 1) Is natural selection creative? (2.08 minutes) and 2) Is natural selection teleological? (4.27 minutes). These clips could be used with students to stimulate class discussion.

Another section of the site focuses on Darwin and Science. The “Beauty and the Seed” subsection uses excerpts from a “letter trail” of Darwin’s correspondence to illustrate how Darwin used such correspondence as a research tool and to illustrate how exploring his letters allows one to discover topics in which he was interested but did not publish.

The Teaching Resources section of the site contains 21 sets of selected letters that have been used in undergraduate seminars exploring Darwin’s life and work. Major topics include Scientific Networks, Scientific Practice, Controversy, Religion, and Beauty. Most topics include sets of letters on several subtopics. A set of questions is provided to assist instructors in structuring discussions. Suggested further readings also are provided.

The screenshot shows the Darwin Correspondence Project website. At the top, there is a navigation bar with links for Home, About, Contact, and Site Map. A search bar is also present. The main content area is titled "About the letters" and includes a section on the "Historical significance of the letters". It features a paragraph about Darwin's correspondence and two images of handwritten letters. A sidebar on the left contains a menu with items like "Home", "About the letters", "Darwin's correspondents", "Explore the letters", "Advanced search", "Darwin & religion", "Darwin & science", "Teaching resources", "About the Project", "News", "Links", and "FAQs".

Figure 4. The Darwin Correspondence Project provides transcripts of letters Darwin wrote and received. Images © Cambridge University Library.

ADDITIONAL WEBSITES

The interactive Beagle voyage on the Natural History Museum site (www.nhm.ac.uk/nature-online/science-of-natural-history/expeditions-collecting/beagle-voyage/) enables visitors to follow the ship's journey around the world. Drawings, photographs, and quotes from Darwin's journals paint a picture of the voyage.

"An Eye for the Eye" link on the Darwin 200 page of Nature News (www.nature.com/news/specials/darwin/index.html) contains a slideshow of 13 beautiful images of eyes from a variety of species, with commentary. Eyes were selected because Darwin knew that the eye, which seems to be "designed," might serve as an argument against natural selection. I was particularly interested to learn that several species have four eyes, each pair with a different function.

Students can use the same methods Darwin used to study plant movements. This work was published in his 1880 book, *The Power of Movement in Plants*. Instructions are provided on Roger Hangarter's Plants-In-Motion site at Indiana University (<http://plantsinmotion.bio.indiana.edu/plantmotion/projects/projects.html>).

The HMS Beagle Project plans to build a replica of the ship and follow Darwin's voyage around the world, conducting educational programs and scientific research (<http://thebeagleproject.com>). I enjoyed reading some of the team's blog entries. You can purchase a T-shirt or sweatshirt to support the effort.

ACKNOWLEDGMENTS

I thank A. Malcolm Campbell for critical comments and helpful suggestions on this article.