

## Human Evolution Education Resources

May 4, 2011

I've been asked on occasion about resources for teaching/learning human evolutionary biology (i.e., physical anthropology). I thought I'd go ahead and put together an annotated list of resources I most frequently use in the classroom, or when I'm catching up on current events in the field, or refreshing my memory about a topic I have to teach "tomorrow" (oh, if you're wondering who I am, find me here: <http://www.linkedin.com/in/cschrein> or here <http://twitter.com/paleophile>).

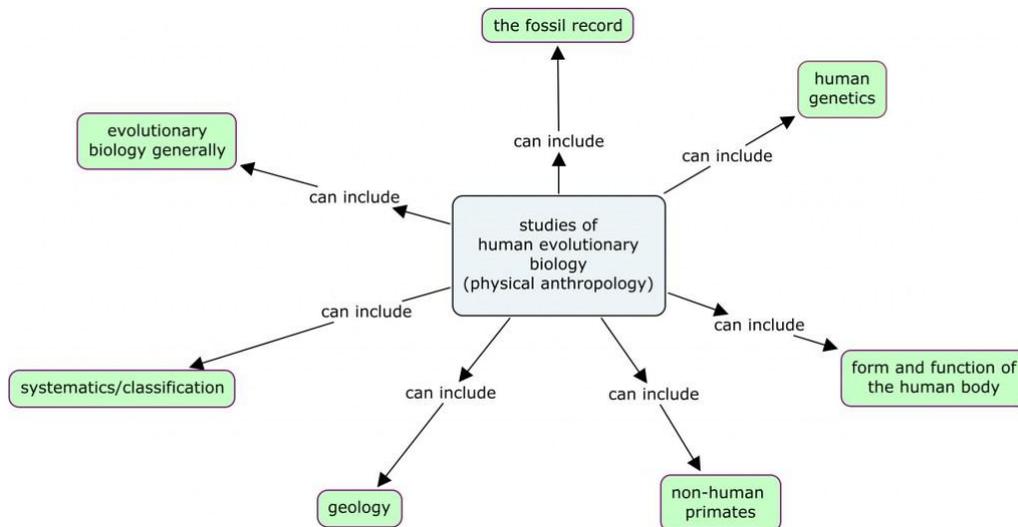
Learning and teaching about human evolution can be daunting, even for professionals in the field, as new material, it seems, is discovered on a regular basis and these new discoveries can really shift the way we view our family tree. In addition, physical anthropology covers a wide range of science topics from genetics to the fossil record.

If you're a K-12 teacher, a community college instructor or university professor, I think you'll find these resources quite useful. And if you're a curious learner, a student of biology, anthropology, or life in general, you will certainly find plenty to while away an afternoon (or four).

As I'm sure expert teachers would tell you, here are a few things to keep in mind:

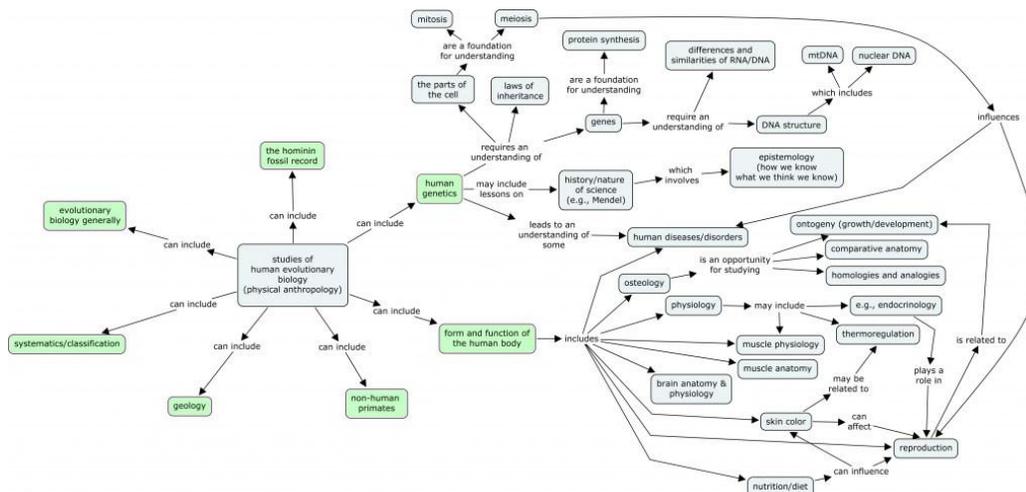
- You don't have to know everything about a subject area to teach it well. A valuable lesson to teach students is how and when to say "I don't know." An equally valuable lesson is to teach your students how to find, and judge the quality of, information on their own (that doesn't mean teaching them to use only one particular well-known search engine, of course).
- It's valuable to think about ways in which you can incorporate the topic of human evolution into your curriculum generally (remember, state standards are not a curriculum, but a guideline for developing your curriculum and a set of expected curricular outcomes); boiling down such a broad topic to one lesson plan makes teaching (and learning) the subject much more challenging.
- The field of physical anthropology is an extremely broad one, which is great for educators (though maybe intimidating), because it allows students to explore many aspects of evolutionary biology, all the while learning something about themselves. It's amazing how much more interested and engaged some students are when they are learning about their body than when they are learning about fish or earthworm anatomy (no offense to ichthyo- or annelid-philes).

Before we talk resources, let's talk about what topics are typically covered in an introductory level college/university course in physical anthropology. Here's a very basic concept map, showing some of the main components to such a course. This map is not necessarily comprehensive (for example, I could very well have included forensic anthropology as a subtopic, but I might put that somewhere between "form and function of the human body" and "human genetics" as an "infratopic," not to get taxonomic or anything...). I'd love to hear from educators who are currently teaching a physical anthropology course, with regard to additional components they typically include.



(c) CMS 2011 This concept map was built using a free download I highly recommend for use in the classroom, CmapTools Knowledge Modeling Kit: <http://cmap.ihmc.us/download/>

Of course, each of these "subtopics" can be broken down into more detailed content, much of which is interconnected. Here's an example using "genetics" and "form and function of the human body." If you are a high school biology teacher, you can see much of the material that is covered in a physical anthropology course overlaps with the content of classes you already teach.



(c) CMS 2011

How would you expand the other subtopics? Make your own concept-map and send it to me and I'll post the best ones!

So, where can you go for quality materials (content, lesson ideas, etc.) that address each of these subtopics? Check out the myriad links, books and more I've posted below.

**Please Note:**

- Most of these resources are free, but some are not (books, "apps," etc.).
- I have no highly vested interest in promoting any of these sources, except for my desire to see quality educational materials utilized for the benefit of science education in America and around the globe. Please consider supporting one of the not-for-profit organizations to which I link and/or your local PBS television station or, what the heck, National Public Radio.
- A number of these resources cover multiple subtopics, but I tried to avoid redundant listings, so be sure to look through all the sections for what you need.
- Click on the [hyperlinks](#) to open websites *or* copy and paste the static URLs into your browser's address bar (all websites accessed May 1-4, 2011, unless otherwise indicated).
- I've included a lot of Twitter handles (e.g., @paleophile) - to learn more about Twitter, scroll down to the "Human Evolution in the News" section. To read the Tweets of individuals/organizations on Twitter, go to <http://twitter.com/handle> (e.g., <http://twitter.com/paleophile>) or "follow" them on Twitter if you are a registered Twitter user. (\*FYI, The Twitter name, logo, Twitter T, Tweet, and Twitter bird are trademarks of Twitter, Inc. in the United States and other countries.)

**GENERAL SCIENCE/HUMAN EVOLUTION RESOURCES**

I could go on and on about how great these sites are, but you will quickly find that out for yourself -- browse all of their amazing \*free\* multi-media content, lesson plans, handouts, citizen-science opportunities, teacher resources and more (including free streaming videos, interactives, etc.). *For many of these sites, I link to more specific content in the sections below.*

[The David H. Koch Hall of Human Origins](#) Smithsonian Institution, National Museum of Natural History (NMNH) [The Hall of Human Origins at NMNH recently celebrated its one-year anniversary. The actual exhibit is full of the latest evidence for human evolution, artist renderings of hominins, movies, interactives, and includes tri-monthly opportunities to meet scientists. The website is spilling over with resources, including a really nice interactive timeline of human evolution, outstanding photographs, and 3D fossil collections. Disclosure: I am not currently, but will be employed in the future, by the Human Origins Initiative at NMNH. @HumanOrigins]

[Anne and Bernard Spitzer Hall of Human Origins](#) American Museum of Natural History (AMNH) [Loads of information about human evolution, interactives, teaching resources, exhibit guide, and more. This isn't the exhibit of your childhood -- it was completely redone a number of years ago. @AMNH]

[PBS NATURE](#) [free videos, free videos, free videos; @PBSNature]

[PBS NOVA](#) and now there is also [PBS NOVA Evolution \(beta stage\)](#) [more free videos, plus cool, current interactives; @novapbs]

[PBS Evolution](#) [the companion website for PBS' multi-part evolution program; lessons, handouts, videos, interactives]

[BBC - Science and Nature](#) [Have I mentioned anything about videos? Be sure not to miss "Human Planet Explorer"; @BBCNature]

[ARKive](#) [See my description of this site under "Non-human Primates" below. One of my all time favorite websites. @arkive]

[TED- Ideas Worth Spreading](#) [short, high-quality videos of lectures by today's greatest minds on every topic imaginable (closed-captioning available); @TEDNews or @TEDtalks]

[California Academy of Sciences](#) (CAS) and [CAS Discover Science](#) [See what CAS researchers are up to, watch lectures, read science blogs, etc.; @calacademy]

[University of California Museum of Paleontology](#) (UCMP) [This sounds specific, but it has a breadth of info and materials about science and evolution generally. "Like" them on Facebook.]

[Howard Hughes Medical Institute BioInteractive](#) (HHMI) [just what it says -- biology interactives -- plus virtual labs, videos, animations, and free teacher resources; @HHMINews]

[SERC Portal for K-12 Educators](#) The Science Education Resource Center (SERC) is an office of Carleton College. [The site has lesson plans, handouts, and much more for almost every area of science for K-12 teachers]

[National Center for Case Study Teaching in Science](#) [See my description below under "Human Genetics."]

## **PHYSICAL ANTHROPOLOGY LABORATORY RESOURCES**

[Virtual Laboratories for Physical Anthropology 4.0](#) Kappelman, J. Online or CD-Rom-based learning environment. Contact your Cengage/Wadsworth representative for information about pricing. [Dr. Kappelman also coordinates the eSkeletons and eLucy sites described below. This is a full set of laboratories for an introductory course in physical anthropology. The labs are full-length (students might typically spend anywhere from 45 - 90 minutes on a single lab), interactive, allow students to collect and analyze data, and include pre- and post-lab assessments. I used some of these labs to supplement requirements for an undergraduate online lecture course at a state university and received positive feedback about them from students.]

[France Casting](#) Museum Quality Replicas [France Casting produces casts of modern human and non-human primate bones and hominin fossils. They even sell casts on behalf of the National Museums of Kenya, which use the money from the sale of casts to maintain their fossil and skeletal collections for researchers and for museum staffing/upkeep. If you're looking for high-quality casts to use in your classroom, a resource that can potentially last decades, check out their website.]

[3D Collections](#) [Various institutions and universities are using digital scanning technology to render 3D images of fossil hominin and primate skeletal materials. Some of those sites are listed below. If you don't have funds to buy casts for your classroom, this is a great alternative. This particular link takes you to the Smithsonian's National Museum of Natural History Human Origins Program 3D Fossil Collection. This collection will continue to grow in the near future.]

*Let's start at 2 o'clock and work our way around our concept map clockwise...*

## **HUMAN GENETICS**

### ***Books:***

Alexander, D. R. The Language of Genetics: An Introduction. Templeton Press, 2011. [This book was published 5/1/11, so I have not read it, but I generally like the material coming out of Templeton Press.]

Ridley, M. Genome: The Autobiography of a Species in 23 chapters. Harper Collins, 1999. [This is a very simply written exploration of the human genome, but note that it is now 12 years old, so there are sections that are surely out of date. The introduction is a great read to give advanced high school students or intro-level college/university students.]

### ***Web materials:***

[Cold Spring Harbor Laboratory's Dolan DNA Learning Center](#) [I can't say enough great things about this website. Go there now (seriously, *now*) for interactives, video tutorials, educator workshops, and tons of media-rich content. Don't really know what a gene is? You will soon! Think you know everything about genes? Ha! You'll see if you do!]

[Scitable Genetics Topic Room](#) Nature Education [I am blown away by the quality of content on the Scitable website. The genetics library includes just about everything you would want to know about genetics via 287, brief, scientist-written, peer-reviewed articles tailored for educators and students (each article is labeled "beginner," "intermediate," or "advanced.") Be sure to check out the "intermediate" article: Adams, J. (2008) Human Evolutionary Tree. Nature Education 1(1) at <http://www.nature.com/scitable/topicpage/human-evolutionary-tree-417>]

[Scitable Essentials of Genetics eBook](#) Nature Education [A \*free\* online genetics textbook from Nature Education. It doesn't get much better than this.]

[Human Genome Resources](#) National Center for Biotechnology Information (NCBI) [This is a resource for advanced users. From their website: " NCBI's Web site serves an an integrated, one-stop, genomic information infrastructure for biomedical researchers from around the world." Browse the human genome, link to OMIM or the Gene Database, etc.]

["Making sense of ancient hominin DNA"](#) UCMP, on the Understanding Evolution website. [This page includes knowledge content, a short bibliography, links to news articles, a video podcast, intra-site links to additional content including teaching resources, such as interactive web activities, and discussion questions. A resource of superior quality. It was last updated July, 2010.]

[Ancient DNA and Neandertals](#) NMNH [A nicely detailed text review of the most current evidence regarding the genetics of Neandertals with a few stunning images of Neandertal fossils and the NMNH's Neandertal reconstruction.]

[Human Skin Color Variation](#) NMNH [Concise text review of the genetic evidence explaining variation in modern human skin color. Also see the Jablonski lecture described in the section below.]

[National Center for Case Study Teaching in Science](#) National Science Foundation. [If you're a science educator and you're not a member of NCCSTS, join now! As of May 1, 2011, their "peer-reviewed collection contains over 366 cases in all areas of science," including genetics. Many are "clicker cases" that can be used with presentation software for instantaneous feedback from students with clicker devices. When it comes to the genetics of modern human diversity, with regard to skin color, I am partial to The Case of Desiree's Baby, which I've used many times in community college/university courses, though I haven't read through any cases since about early 2010.]

## **FORM AND FUNCTION OF THE HUMAN BODY**

### ***Web materials:***

[eSkeletons](#) The University of Texas at Austin [This free website is a fantastic resource for studying human osteology and comparative primate anatomy. Compare the bones of a human to those of a chimpanzee, or compare a tarsier skeleton to that of a mouse lemur...the fun never stops. Images are based on digital scans of real bones and many can be rotated in 3D. What's so fantastic is that there is a taxonomy for the Order Primates included, so you don't even have to know what a galago is before you visit the site!]

[AnatomyLab.com](#) [This free website includes learning/teaching resources for human gross anatomy, an interactive anatomy atlas, anatomy puzzles, and a digital photo archive. I have the iPhone app, which currently costs \$9.99 and includes superb images of a complete cadaver and multi-layer dissections with loads of information. Oddly enough, I can't seem to figure out who the heck created all of this - that part of their website is "under construction."]

[The Body Interactives](#) BBC Science [I really like the interactives on this BBC site. They include great rotating 3D graphics. These interactives could work for elementary school or even college/university courses. Interactives include: Organs, brain map, skeleton, puberty, muscle, nervous system, and senses. Users drag and drop items onto the proper place in the body and locate structures/features. I also like that the user gets to select a gender before beginning. ]

[Genes to Cognition Online 3D Brain Anatomy](#) [Another Cold Spring Harbor Laboratory win. This is a free website dedicated completely to brain anatomy and the focus is a 3D brain that students can rotate and click on to their hearts' or brains' content. Tons of excellent, up-to-date content about brain anatomy and research (including primary references), accompanied by beautiful graphics. I use this all the time - online and via the iPhone/iPad app! Also available for Android and Windows 7 devices!]

[The Zoo of You](#) PBS NOVA Evolution [A very cool interactive for a comparative anatomy and/or embryology lesson, authored by none other than Neil Shubin, professor of anatomy at the University of Chicago, and author of the great book *Your Inner Fish: A Journey Into the 3.5-Billion-Year History of the Human Body* (Vintage, 2009). This would be good for an advanced high school biology course, such as Honors, AP or IB, or a college/university course. It will probably raise quite a few questions, so I would spend a little time with your "inner fish" before you and your students dive into the interactive. If using this as part of an embryology lesson, I would also use "Guess the Embryo" at: <http://www.pbs.org/wgbh/nova/evolution/guess-embryo.html>]

[Darwin's Birthday Suit: The Evolution of Human Skin and Skin Color](#) Lecture, Jablonski, N. (Feb. 10, 2009) Audio podcast (.mp3 stream/download) and written transcript. [I love this lecture! I actually edited it down a bit, made my own slides to go with it, and used it in both an undergraduate biology and anthropology course (with Dr. Jablonski's permission). Dr. Jablonski and her husband, George Chaplin,

published a paper in 2010 comparing UV data with published data on skin color in indigenous populations from more than 50 countries. Their research provides the first comprehensive theory explaining skin color variation. Dr. Jablonski is a great lecturer and is very easy on the ears. A must listen for every human, young, old, novice and expert! It's also available via iTunes, so you have no excuse not to listen to it on the way to work tomorrow.]

[McGraw Hill's Anatomy & Physiology Revealed](#) in partnership with the University of Toledo. Online or CD-Rom-based learning environment for human gross anatomy. Contact your McGraw Hill rep for pricing (bundle it with other materials for a discount!). [This is a comprehensive resource for all things A&P. Multi-layer cadaver anatomy, X-ray, MRI and CT images, histology images and content, high quality animations, self-tests, etc. Here's an overview video: <http://auth.mhhe.com/APR/MakingOfAPRvideo/Making4.mov> I have used this in human evolution and A&P courses I have instructed.]

## **NON-HUMAN PRIMATES**

### ***Web resources:***

[Arkive.org](#) [This incredible free website speaks for itself. Photos, videos galore and loads of information about Earth's living creatures. It is one of my all time favorite websites. It's a lot of fun to let kids explore this site. Explore by scientific or common name, eco-regions, student target age, media type, and more. And sometimes they have contests and you can win cool prizes! I use the images in videos in lectures all the time (the copyright info is right on the images/videos, so you don't have to worry about that).]

[Animal Diversity Web](#) University of Michigan Museum of Zoology [This site allows one to take a multi-media tour of the Kingdom Animalia. You can browse photos/images of living creatures and skeletons, listen to audio tracks of animal sounds, and read detailed content about each taxonomic group. It's a great place to go if you need a 3D rotating western gorilla skull in a snap.]

[Primate Info Net](#) Library and Information Service of the National Primate Research Center, University of Wisconsin-Madison [Everything you could ever want to know about the Order Primates and more! Primates in the news, factsheets, information about keeping primates as pets, conservation resources, and a live web broadcast of the WPRC's common marmoset families.]

[African Primates](#) Online journal. [This scientific journal is internationally open-access, peer-reviewed and fully indexed. Get your journal club on!]

Various organizations dedicated to ape conservation (Each site has a wealth of information and, often, multimedia content about apes and the areas in which apes live): [Center for Great Apes](#), [the Jane Goodall Institute](#), [The Orangutan Land Trust](#), [Bonobo Conservation Initiative](#), [International Gorilla Conservation Programme](#), [The Dian Fossey Gorilla Fund International](#)

## **GEOLOGY/PALEONTOLOGY**

### ***Web resources:***

[USGS Education](#) ["The U.S. Geological Survey provides scientific information intended to help educate the public about natural resources, natural hazards, geospatial data, and issues that affect our quality of life. Discover selected online resources, including lessons, data, maps, (educational videos and

animations, and online lectures), to support teaching, learning, education (K-12), and university-level inquiry and research." Materials are tailored to both K-12 and college/university students.]

[Teach the Earth](#) SERC [I'm not actually familiar with this particular SERC portal, but it was recommended to me by a geologist friend. Here's the description from the site: "Teach the Earth is a portal into the rich geoscience education content available through dozens of independent project websites. The Teach the Earth portal is a handful of web pages which can help guide you through this diverse array of sites. It includes a search interface spanning all the projects, and a set of site guides which highlight key resources within these project websites. You can make use of the search and guide links above or jump to the complete list." Here's the complete list:  
[http://serc.carleton.edu/teachearth/site\\_guides/projects.html](http://serc.carleton.edu/teachearth/site_guides/projects.html)]

[Earth: A dynamic structure Short Course](#) UCMP ["This course is designed for teachers interested in Earth/Life/Physical sciences and focuses on the California Science Standards for Grades 6-8. Participants will learn about the Earth as a dynamic structure, composed of the lithosphere (land), hydrosphere (water), atmosphere (air), and biosphere (living things)." I have not taken this course, but it's from UCMP, so you certainly have nothin' to lose by taking it.]

[Understanding Geologic Time](#) UCMP [This educational module has both student and teacher components. "*Understanding Geologic Time* is an informational tour in which students gain a basic understanding of geologic time, the evidence for events in Earth's history, relative and absolute dating techniques, and the significance of the Geologic Time Scale. " Teacher component includes lesson plans, standards, handouts, and assessments.]

[Deep time in perspective: An animated fossil hominin timeline](#) Dunsworth, H. M. *PaleoAnthropology* 2011: 13-17. [This link actually takes you to a post (April 8, 2011) on the blog, "The Mermaid's Tale," where the author of the deep time movie discusses the content of and background for this online, animated demonstration of deep time. The animation begins around the time of the split between the human and chimpanzee lineages. Disclosure: This animation and the accompanying article and blog post are authored by a good friend of mine, but that allows me to say they were authored by a rising star in the field of paleoanthropology - a brilliant and brilliantly witty woman. So check them out.]

[The Paleontology Portal](#) UCMP [I once showed this website to some Arizona teachers and they actually gasped. This is a very well-organized collection of materials produced by UCMP, PaleoSociety, Society for Vertebrate Paleontology, and USGS that covers almost every aspect of North American paleontology. Resources include a who's who of paleontology, a fossil gallery, searchable by taxonomic group or time period, field guides, maps, and teacher education resources.]

[Dating](#) NMNH [This page includes a list of commonly used dating methods and a short description of each. A useful, quick reference for any singles out there. Kidding. It's useful for people in committed, meaningful relationships, too.]

[Adventures in the Rift Valley: Interactive](#) NMNH ["Since 1985, Smithsonian scientists have worked with the National Museums of Kenya to excavate the landscapes of Olorgesailie, Kenya. See how the team searches for evidence to answer questions about how human ancestors lived during the past one million years." This interactive is primarily clicking and reading, so it would be better for older students, maybe in an advanced high school biology or college/university course.]

## SYSTEMATICS/CLASSIFICATION

### *Web resources:*

[The history of life: Looking at the patterns](#) UCMP [This is part of the UCMP Evolution 101 "course." It's a great, good-looking, well-written lesson on the basics of taxonomy, phylogenetics, homologies, analogies and more. I often grab images from this page or send students to it for a clearer, more concise explanation than many textbooks give. My only criticism is that their use of "family tree" and "phylogeny" can be confusing (instead of distinguishing between "cladograms" and "phylogenies").]

[A name by any other tree](#) Thanukos, A. *Evolution: Education and Outreach* (April 18, 2009) [EEO is a relatively new journal. It is no longer open access, but if you can get it, do! It's a must-have for any educator who is interested in teaching/learning about evolution. "This article (appropriate for grades 9-12) comes with links to additional examples, supplementary information, and classroom tips. It is available \*free\* as a .pdf at <http://www.springerlink.com/content/k176638503p63017/fulltext.pdf> "

[Travels in the Great Tree of Life](#) Yale University Peabody Museum of Natural History [Two short films are available via this link: "Discovering the Great Tree of Life" and "Why Study the Tree of Life?" In addition, you can click on "Learn About the Tree of Life!" for a nice tutorial on taxonomy/phylogenetics along the same lines as the UCMP Evolution 101 course. The "Tree of Life Adventure Game" link is a teaser -- the game is only available at the museum.]

[Time Tree](#) ASU Biodesign Institute/Penn State [Have you ever wondered when banana plants diverged from their veg relatives? How does that compare to when wolves diverged from their furry cousins? The time tree website and smart phone application will tell you! This is a fun tool to use on a Sunday afternoon when it's raining outside and you're not in a puddle-stomping mood, or in the classroom with some curious kids. It also comes in handy at 3am when you're prepping that lecture for 9am. Check it out! According to the site: "the taxonomy hierarchy used in TimeTree is NCBI's Taxonomy Browser with only limited adjustments (corrections) at present."]

[Taxonomy Browser](#) NCBI [Just what it says. A browser for taxonomic groups. Fun! No, really. It's fun! Search for "Pan paniscus" (the bonobo) and you'll get links to some of the other sites I've listed here, plus information about research on the bonobo genome. Told you. Fun.]

## EVOLUTION

I'm sure there are mountains of great evolution resources (especially books) out there, but here are just a few of my favorites.

### *Books:*

Zimmer, C. [The Tangled Bank: An Introduction to Evolution](#) Roberts & Company Publishers, 2010 [Carl Zimmer's very recent (not newest, believe it or not) book -- what is soon to become the standard undergraduate text on evolution (or so I believe). But, you know, you don't have to be a college co-ed to enjoy this read. You can get it online at many book merchants. Qualified instructors (only) can contact the publisher and inquire about qualified instructor discounts for desk copies. Link to Dr. Zimmer's blog below.]

### **Web resources:**

[Understanding Evolution UCMP](#) [At the moment, I would consider this the premiere site for knowledge content regarding the teaching/learning of evolution. This page links to Evolution 101, an in-depth course on the science of evolution for everyone, K-16 teaching materials and a resource library. I have sent countless students to the Evolution 101 pages and many teachers to the teaching materials/resource library. The graphics are kid- and adult-friendly, the writing is high quality, but not above the head of a high school student, by any means, and the site itself is user-friendly and never preachy.]

[PBS Evolution](#) [The companion website for PBS' multi-part evolution program; lessons, handouts, videos, interactives galore. I have frequently used the very awesome (*Is this my first "awesome?" I doubt it.*) "An Origin of Species" pollenpeeper interactive lesson, simulating the evolution of Darwin's (a.k.a. the Grant's) finches in undergraduate courses, found here:  
<http://www.pbs.org/wgbh/evolution/darwin/origin/>]

[National Center for Science Education](#) "Defending the teaching of evolution in public schools" [What's the deal with Intelligent Design, anyway? Find out on the NCSE page. NCSE is an extremely well-respected organization in the scientific community. The quality of resources and information on the NSCE site is exceptional. Who supports NCSE, you ask? "NCSE's members come from all walks of life. Many are teachers and professional scientists who care intensely about the quality of science education. Others are parents, clergy, science enthusiasts, and concerned citizens."]

[The National Evolutionary Synthesis Center Education Resources](#) NESCent is jointly operated by Duke University, UNC at Chapel Hill, and North Carolina State University [This site has Evolution in the News stories, curriculum resources, examples of evolution, and professional development opportunities. Disclosure: I'm proud to say I will be a NESCent pre-doctoral fellow in the Fall, 2011, semester.]

[Evolution 3rd Ed.](#) Ridley, M., Blackwell Publishing, 2003 [Mark Ridley's [Evolution](#) has become one of those "classic texts" for undergraduates. This companion site has sample chapters, tutorials, experiments, videos, and images, oh my! And all for free! But the best part? The online glossary. Need a quick definition for "antagonistic coevolution?" Bam! You got it. In fact, I'm linking you straight to the glossary, which I happen to use quite often.]

### **THE HOMININ FOSSIL RECORD (finally, we made it!)**

#### **Books:**

Johanson, D. C. & Wong, K. [Lucy's Legacy: The Quest for Human Origins](#). Harmony Books, 2009 [Not only does Dr. Johanson recount the story of finding Lucy's fossilized bones, but he shares his thoughts on much more recent discoveries in the field of paleoanthropology, such as the small-statured hominins from the island of Flores. Great for the lay reader or to assign to students in a high school class or college course. Disclosure: Dr. Johanson is my thesis advisor; he did not ask me to post this recommendation, I genuinely enjoyed this book, and, in fact, truly felt I did not want to put it down and was 100 pages in before I knew it.]

Johanson, D. C. & Edgar, B. with David Brill photography. [From Lucy to Language](#). Simon & Schuster, updated 2006. [The best coffee table book/reference book you'll ever spend your hard earned money on. Makes an awesome gift for a science fan and could even be used as a text for an introductory human origins course. David Brill's photographs of the major fossil discoveries in paleoanthropology (those published as of 2005/6) are stunning.]

Potts, R. & Sloan, C. [What Does It Mean To Be Human?](#) National Geographic, 2010. [This is the companion book to the now one-year-old Hall of Human Origins exhibit at the Smithsonian's NMNH. Fantastic photography and current, fluidly-written content make this book a must-have for anyone who is interested in human origins. Disclosure: I will be, but am not currently employed by NMNH. I have a copy of this book and believe it to be a great reference.]

[Physical Anthropology Booklist.pdf](#) [Here is a list for you of other books, new and old, some more technical, some more "popular." Take a pic, grab a beach blanket and a cooler of cold ones, and enjoy the summer.]

### ***Web resources:***

[Human Evolution Timeline Interactive](#) NMNH [Someone once said something about the beginning being a very good place to start. But when did humans begin? When did humanity begin? You'll have to explore this timeline to investigate the answers to those questions. Unlike some other timelines, this one is interactive, kept up to date, includes climate, as well as fossil data, and marks major transitions in human evolutionary history...oh, and it starts with the end at the beginning (modern humans on the left, earliest hominins on the right). I really do think this is the best place to start if you're just beginning to explore human origins, and it's a great reference when you're in the middle (or approaching the end) of a project and need some inspiration. My only criticism is that the Flash content seems to go down once in a while on the NMNH site and that makes it difficult to plan to use this in a classroom when you have only a small window of time in which to take advantage of it.]

[The Human Lineage Through Time](#) *Becoming Human*, Institute of Human Origins (IHO), Arizona State University [This is another timeline of hominin evolution. It's simpler than NMNH timeline, in that it only presents representative fossils of the different hominin taxa (not climate information). The fossil sketches used for the timeline are very true-to-life (they were also used in Johanson & Wong's 2009 book) and make the timeline aesthetically pleasing. This timeline is interactive; each fossil can be selected to obtain more information about its species. My only criticism is that the timeline window (from top to bottom) doesn't fit on my monitor, so I have to do a lot of scrolling up and down, as well as back and forth. That may not be an issue for everyone, though.]

[Human Family Tree](#) NMNH [If a timeline is not what you're looking for, then a friendly face might do you right. NMNH has made big changes in its online human family tree since the development of the new exhibit (it used to be an interactive phylogeny in an area called "The Hall of Human Ancestors," in case you were wondering). Now it looks like the strong, bushy tree that it should, with 18 taxa arranged neatly into four groups (a sorting with which some scientists might take stock). It's perfect for someone who wants a clear, broad overview of what's been happening for the last 6 - 7 million years. What I find nice is that artist reconstructions or sketches of hominins represent each taxon and can be clicked on for further exploration of each group. Each named species has a summary page, though not every species has a pretty face.]

[Hominin Fossil, Primate and Artifact Collections \(2D and 3D\)](#) NMNH [The NMNH virtual fossil/bone/artifact collection is expanding all the time. The collections include crisp, detailed 2D images of hominin fossils, searchable by age range and type (skull vs. skeleton). In addition, the collections include 3D renderings, based on CT scans of fossil, bone or stone material. The 3D specimens can be rotated with the click-and-drag of your mouse. Recently, they added a 3D model of an orangutan skull, so I imagine there is more modern primate material to come. The basic 3D viewer requires Adobe (TM) Flash player. If you want to see the model in 3DCT ( the model based directly on the CT scan slices), or in PowerPoint format, you'll need a plugin for your browser, available on the NMNH site.]

[Human Evolution: The fossil evidence in 3D](#) Walker, P. L. & Hagen, E. H. UC Santa Barbara. [I'm not sure when this site was last updated, and I'm guessing that the written content really needs updating, but the 3D rotating skulls are still great to look at. Images are in black and white and include living primates as well as fossil hominins. The site requires Shockwave.]

[eLucy](#) The University of Texas at Austin [From the creators of eSkeletons comes eLucy! This is one of the greatest ideas a physical anthropologist has had in a long time! (Ok, well, it's up there, for sure.) The UT Austin folks have made it possible for you to compare all the bits and pieces of Lucy's skeletons (we're talking rotating 3D images of casts, not drawings) to the same components of a human and/or chimpanzee skeleton. In addition, there are high quality teacher resources for studying Lucy in the classroom, including life sized printouts and online material for students, like crossword puzzles. The UT Austin anthropology program is really dedicated to education and outreach and I happen to know there are some really great opportunities for K-12 education that will be coming out of UT Austin in the near future, so keep your clicker fingers on the eAnthro websites!).

[Becoming Human](#) Institute of Human Origins, Arizona State University [I think of this as the education website for the Institute of Human Origins (IHO), as it provides knowledge content, interactives, lesson plans, printable materials for the classroom, and more. It's really becoming (no pun intended) a nice go-to-first resource for human evolution education. There have been significant improvements to the site in the last few years and new components are currently in development. I highly recommend the interactive documentary detailing life and research in Hadar, Ethiopia. You can also get some news headlines and information about IHO via the page - this year is the 30th anniversary of the IHO and ASU/IHO will be hosting special events throughout the year.]

[Discovering Ardi](#) Discovery Channel [Ok, so you've probably noticed I don't have an overwhelming number of links to Discovery content (I'm just not a big fan), but I must give credit where credit is due and, with the Discovering Ardi special website, they deserve a lot of credit, as do the researchers who are credited with finding this hominin. There's a lot of interesting content on the site, including photos from the moment of discovery and video interviews with the researchers. The announcement of the *Ardipithecus* fossil skeletal material was big news in the field of paleoanthropology, in part because the community had been waiting many many years for the discoverers to make the remains public (for various reasons, not to be discussed here). In addition, "Ardi" is quite an interesting creature and I have some sneaking suspicions that one of the empty clusters of branches on the NMNH human evolutionary tree might deserve to have a hominin in it, and maybe it should be this one. Am I being cryptic? Sure. But you can learn all about "Ardi" on this website and if you want to know even more, an entire issue of the journal *Science* (the journal of the American Association for the Advancement of Science - see below) was dedicated to papers about "Ardi's" fossil remains and paleoenvironment.]

## **HUMAN EVOLUTION IN THE NEWS**

Here is a selection of science blogs, science Twitter feeds, and science journalism/headline news sites that I and/or my colleagues check up on regularly. I get most of my science headlines via Twitter these days (I am both @paleophile and @HumanOriginsASU; the latter is the account for an undergraduate course at Arizona State University.). To read the Tweets of individuals/organizations on Twitter, find their handle (e.g., @paleophile), go to <http://twitter.com/handle> (e.g., <http://twitter.com/paleophile>) or "follow" them on Twitter if you are a registered Twitter user. You can also check out who I follow to stay "abreast" of the news via the little blue bird. Note, also, that many of the organizations listed above and below have Facebook pages that you can "like."

[Cambridge Science Festival](#) Not familiar with web blogs, Tweets or umm...any thing that doesn't involve your fingertips turning black? Watch this Cambridge Science Festival video podcast (May 3, 2011) to hear some of the bloggers listed below talk about how blogs, tweets, and social media are changing science writing.

[ScienceBlogs](#) [Now under the aegis of National Geographic, from what I hear. There are heaps upon heaps of blogs here. Yeah...I'm just going to let you wade through these on your own...but be sure to leave room for rumination when you stumble upon *Pharyngula*, PZ Myers' always entertaining, often strongly worded, blog about evolution.]

[The Loom](#) (a Discover blog) Carl Zimmer [@carlzimmer; Mr. Zimmer is one of science's original, and very finest web bloggers. He is also a contributing editor and columnist for Discover magazine and a self-employed book author. You can visit his personal website at <http://carlzimmer.com/>]

[Not Exactly Rocket Science](#) (a Discover blog) Ed Yong [@edyong209; Mr. Yong has an MA and MPhil in Natural Sciences and Biochemistry, respectively, and has been blogging about science since 2006.]

[Tooth and Claw](#) (a PLoS blog) Hillary Rosner [@hillaryrosner; A good old fashioned "paper" freelance journalist for many years, Hillary is relatively new to blogging, so show your support. Please. Plus, there's a photo of her hugging an orang-utan on her blog.]

[John Hawks Weblog](#) (blog) Dr. John Hawks [@johnhawks; Dr. Hawks blogs about all things human evolution. A great place to go if you're looking for a critique of the latest hominin-related or human genetics-related Science, Nature or PNAS article.]

[Lawn Chair Anthropology](#) (blog) Graduate students at the University of Michigan in biological anthropology

[Afarensis: Anthropology, Evolution and Science](#) (blog) Timothy S. McDougald [This blog author writes as *Australopithecus afarensis*, so it's more difficult to judge the content, however, it's a popular blog among anthropologists.]

[A Very Remote Period Indeed](#) (blog) Dr. Julien Riel-Salvatore [Julien is a graduate of Arizona State University's archaeology program and a great writer regarding all things archaeology.]

[Anthropology in Practice](#) (blog) Krystal D'Costa [@anthinpractice; Ms. D'Costa hold an MA in Anthropology from the New School for Social Research in NYC. She blogs about anthropological news and all things anthropological that strike her during her daily adventures in NY (read: an anthropological take on subtle subway romances).]

[Kathryn B. H. Clancy, PhD](#) [Dr. Clancy's homepage links to her blog "Context and Variation" and totally enjoyable Twitter feed @KateClancy. If you're interested in evolution and female anatomy, you better get to her site fast.]

[Kate Wong](#) [@katewong; Kate Wong is a science writer for Scientific American and traditionally writes about human evolution content. She has also co-authored books with Dr. Donald Johanson, including the new book, [Lucy's Legacy](#), which I strongly recommend.]

[Ann Gibbons](#) [Ann is one of the more prolific science writers writing about human evolution and she typically reports on annual anthropology conferences. This link takes you to a list of many of her human evolution-related articles (and her new book about human evolution).]

[KQED Science](#) [@KQEDscience; KQED handles public media for northern California. Their Tweets are some of the best science Tweets out there. And I just discovered they have a really fantastic website, too.]

[New Scientist](#) [@newschemist; daily science news]

[ScienceDaily](#) [@sciencedaily; good, brief news reviews of the latest scientific research]

[LiveScience](#) [@LiveScience; science news, updated all the freakin' time]

[American Scientist Magazine](#) [@AmSciMag; "the award-winning magazine of science and technology published by Sigma Xi, The Scientific Research Society"]

[Scientific American Newsletters](#) [@sciam ; Sign up for free daily, weekly or as-it-happens newsletters, delivered to your inbox, or be notified when special issues come online.]

[Human Origins Program Events](#) NMNH [@HumanOrigins; This link actually takes you straight to the events page for HOP - there are always at least three free events with scientists that take place right in the new Human Origins exhibit.]

## **PROFESSIONAL SOCIETIES/ASSOCIATIONS/FOUNDATIONS**

Become a member of any one of these, check out their websites, and/or subscribe to their journals. Each association or society has a least one major conference per year, as far as I know.

[American Association of Physical Anthropologists](#)

[Paleoanthropology Society](#)

[American Anthropological Association](#) [@AmerAnthroAssoc and @AAAPubs]

[The Leakey Foundation](#) [@TheLeakeyFndtn]

[American Association for the Advancement of Science](#) [@AAAS\_News]

[National Science Foundation](#) [@NSF]

[Society of Vertebrate Paleontology](#) [@SVP\_vertpaleo]

[National Center for Science Education](#) [@NCSE]

[The Society for Integrative & Comparative Biology](#)

[The Society for the Study of Evolution](#)

[American Institute of Biological Sciences](#) [@AIBSbiology]

[National Geographic](#) [@NatGeoScience, @NatGeoNewsWatch, @NatGeoEducation I much prefer the magazine to the web content, especially when it comes to human evolution. The website uses a maddening number of "missing link" headlines, fishing for hits, and often makes noticeable mistakes in the presentation of paleoanthropology research. But the print magazine is still one of my favorite things in the world.]

## **SCIENTIFIC JOURNALS**

### ***Open Access Web Journals:***

[Directory of Open Access Journals](#) [DOAJ is a search engine that gives you access to "free, full-text, quality-controlled (I guess they're not all peer-reviewed) scientific and scholarly journals, covering all subjects and many languages." As of May 3, 2011, DOAJ gives you access to 6466 journals, which equates to over 1/2 million articles. "The blog Edu-tastic, which is focused on bringing their readers the best in learning resources, has chosen to list DOAJ as one of the 20 most useful search engines for students."]

Below is a handful of the best open-access journals for physical anthropologists.

[BMC Genomics](#)

[BMC Evolutionary Biology](#)

[PLoS Genetics](#)

[PLoS Biology](#)

[Trends in Evolutionary Biology](#)

[Genome Biology and Evolution](#)

[Ideas in Ecology and Evolution](#)

[Journal of STEM Education: Innovations and Research](#)

### ***Restricted Access Journals:***

[Scientific Journals List.pdf](#) [Here's a .pdf I made of a list of scientific, peer-reviewed journals with content relevant to physical anthropologists. These journals (as far as I am aware), are not open access and would require library/university licenses/subscriptions to get their content for free (otherwise, they are usually on a pay-by-article or subscription-only basis). A few restricted access journals are on Twitter: @NatureNews is great. Nature even has a Mac OS app, but I'm not a big fan since I can't use my university library privileges to access the full text of the articles through the app (nudge-nudge, Nature).]

## **PALEOANTHROPOLOGY/ARCHAEOLOGY FIELD SCHOOLS**

You might be surprised to learn that there are more than a few field schools where students (primarily undergraduates) can actually go and DO physical anthropology around the globe. Lucky for me (and those of you whose eyes are turning red from reading this blog post), the Smithsonian National Museum

