

Beth Shapiro

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Curriculum Vitae

Born: 14 Jan 1976
Citizenship: USA

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Education:

DPhil (Zoology) Oxford University, 2003.
MS (Ecology) University of Georgia, 1999.
BS (Ecology) University of Georgia, 1999.

Current Position:

Associate Professor, Ecology and Evolutionary Biology, UC Santa Cruz, (2012- present)

Past Positions:

Shaffer Associate Professor, Department of Biology, The Pennsylvania State University (2011-2012)
Shaffer Assistant Professor, Department of Biology, The Pennsylvania State University (2007- 2011)
Director, Henry Wellcome Ancient Biomolecules Centre, Oxford University (2004-2007)
Royal Society University Research Fellow, Oxford University (2006-2007)
Wellcome Trust Research Fellow, Oxford University (2004-2006)

Selected Honors and Awards:

Packard Fellow, 2010
PopTech Science and Public Leadership Fellow, 2010
National Geographic Emerging Explorer, 2010
MacArthur Fellow, 2009
Searle Scholar, 2009
Visiting Fellow, Isaac Newton Institute for Mathematical Sciences, 2007
Smithsonian Young Innovator, 2007
University Research Fellow, The Royal Society, 2006
Research Fellow, Balliol College, 2002, 2006
Rhodes Scholar, 1999

Scientific Service:

Associate Editor, *Molecular Biology and Evolution* (2007- current).
Guest Editor: *Proceedings of the National Academy of Sciences USA*.
Scientific Advisory Board: *Museum of Beringia*, Dawson City, YT.
Organizer: *Genome10K 2015*.
Member: Public Interfaces of the Life Sciences Roundtable, The National Academies (2013-2015)
Panelist: *Public Interfaces of Science*, The National Academies.
Panelist: *Molecular Evolution and Genomics* funding panel, Genes and Genome Systems Cluster, Division of Molecular and Cellular Biosciences, The National Science Foundation.
US Co-Chair: *Indonesian-American Kavli Frontiers of Science*, The National Academy of Science.
US Session Chair: *German-American Kavli Frontiers of Science*, The National Academy of Science.
Reviewer for >20 peer-review journals including *Science*, *Nature*, *PLoS Biology*, *Current Biology*, *PNAS*, *Proc Roy Soc B*, *Biology Letters*, *Molecular Ecology*.

Public Understanding of Science: I am and have been involved with several organizations to promote the public understanding of science. I am a featured speaker for Pop!Tech salons, have been featured on NPR's Voice of America, the EarthTalks series, the Polar Field Services newsletter, and national and international new channels, newspapers and magazines including Smithsonian Magazine and National Geographic Magazine. I am currently working with National Geographic to develop a documentary about polar bears.

Professional Memberships:

American Association for the Advancement of Science
Society for Molecular Biology and Evolution
International Biogeography Society
Canadian Quaternary Association

Research Interests:

Molecular evolution; Genome evolution; The interface of genomics and climate change; Ancient DNA; Paleontology; Human evolution, Extinction and speciation; Reconstructing demographic changes through time.

Selected Invited/plenary talks:

Upcoming Public Speaking Events

SciFoo 2014. Googleplex. Mountain View, CA. July 2014.
Opening ceremony, Prince of Wales Northern Heritage Center. Yellowknife, NWT. Fall 2014.
Ferguson Lecture. Washington University St Louis. Spring 2015.

Upcoming Academic Speaking Events

Ancient DNA. Kavli Frontiers of Science. Irvine, CA. November 2014.
Plenary Speaker: *Plant and Animal Genomes*. San Diego, CA. January 2015.
Duke University. 3 April 2015.

Past Public Speaking Events (selected)

Science Speed Dating hosted by the Science and Entertainment Alliance, National Academies of Science. Hollywood, CA. June 2014.
Reviving the Passenger Pigeon. Smith Nature Symposium. Ryerson Woods, Chicago Ill. 17 May 2014.
Commencement Address. Harvey Mudd College, Claremont CA. 18 May 2014.
Extracting DNA: The Power to Restore Life. City Arts and Lectures Series, with help from the California Academy of Sciences. Nourse Theater, San Francisco, CA. 8 April 2014.
Resurrecting the Dead. Deep Time, Global Change, and You. Vancouver, BC. 6 March 2014.
Illumina, Inc. San Diego, CA. 27 March 2014.
Resurrecting the Dead. Denver Museum of Nature and Science. September 2013.
What makes a species? The twisted tale of brown and white bears. Illinois Math and Science Academy Great Minds. Chicago (April 2013).
Ancient DNA: What it is, and what it could be. TEDxDeExtinction. National Geographic, Washington DC. March 2013.
Frontiers in Biology Research Series. Princeton University Press. Princeton, NJ. April 2012.
Tracing molecular evolution through space and time. Ideafest. University of South Dakota, Vermillion, SD. April 2011.
The Holocene Mass extinction. Pop!Tech 2010. Camden, Maine. October 2010.
Should we care about biodiversity? SciFoo. Googleplex, Mountain View, CA. July 2010.

Understanding extinction. National Geographic Society. Washington DC. June 2010.
How to clone a Dodo. DNA and Darwin Series, The Chautauqua Institute, Chautauqua, NY. August 2008.

Past Academic Speaking Events (selected)

Is de-extinction inevitable? Oxford Megafauna. Oxford, UK. March 2014.
Revealing the past using ancient DNA. UC Davis. Davis, CA. 28 April 2014.
Paleogenomes, ice-age megafauna, and rapid warming: How genomes from the past can help predict the consequences of future climate change. Plenary speaker: Association of Genome Biology and Technology. Marco Island, FL. February 2014.
The influence of Late Pleistocene climate change on the North American megafauna. Plenary speaker, Canadian Quaternary Association Annual Meeting. August 2013..
Sex, lies, and Grolar Bears. Genome 10K III. Fort Lauderdale, FL. April 2013.
Inferring population history on a glacial scale from multi-locus genomic data. Society for Molecular Biology and Evolution Annual Meeting. Dublin, Ireland. July 2012.
Multiple hybridizations between brown and polar bears during the Late Pleistocene. CAS-MPG Partner Institute for Computational Biology, Shanghai, China. June 2011.
Following bears through time using ancient DNA. Departments of Biology and Biostatistics, University of California Los Angeles and UCLA Medical School. Los Angeles, CA. April 2011.
Tracing Evolution through space and time. Department of Genetics, Stanford University Medical School. Palo Alto, CA. January 2011.
Do we need a true structured coalescent? DNA, Genetics and the History of Mankind. Banbury Center, Cold Spring Harbor Lab, NY. November 2010.
Understanding extinction (Distinguished Lecturer). School of Life Sciences, University of Nevada at Las Vegas, Las Vegas, NV (March 2010).
Measuring evolution through space and time. Boehringer Ingelheim Fonds Fellows Retreat. Cold Spring Harbor Lab, NY. October 2009.
Several millennia in the lives of polar bears. Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany. August 2009.
The rise and the fall of the Beringian megafauna. Plenary Lecture. Canadian Quaternary Association. Vancouver, Canada. May 2009.
The rise and the fall of the Beringian megafauna. 15th Annual German-American Frontiers of Science Symposium. Alexander von Humboldt Foundation and the National Academy of Sciences. Irvine, California. April 2009.
The rise and the fall of the Beringian megafauna. Kansas University Museum of Natural History. Lawrence, KS. April 2009.
Reconstructing demographic change through space and time. International Biogeography Society, Merida, Mexico. January 2009.
Did we kill the Megafauna? Harvard Broad Symposium on the Scientific Study of the Human Past. Harvard University, Cambridge, MA. December 2008.
Inferring the demographic history of measurably evolving populations using ancient DNA. Krishnaiah and Katri Lecture Series. Department of Statistics, Penn State University, University Park PA. October 2008.
Measuring evolution through space and time. GeoGenetics Interdisciplinary Research Colloquium. Huck Institute of Life Sciences, Penn State University, University Park, PA. February 2008.
Did we kill the Megafauna? Special Seminar (University Foundation) University of Georgia, Athens, GA (January 2008).
Using gene sequences to trace evolution through time and space. Andrew W Mellon DNA and History seminar series, UCLA. January 2008.
Ancient DNA: advances in phylogenetic methods. Fundación Ramon Areces, Madrid, Spain. April 2007.

Teaching:

UCSC: I am currently developing two courses to be taught at UCSC: Molecular Ecology (to be taught during Fall 2014) and Arctic Ecology, a field course to be taught every other year beginning summer 2013.

Biology 110 (PSU) *Basic Concepts and Biodiversity*. I co-taught this large (~720 student) course.

Biology 439 (PSU) *Practical Bioinformatics*. I have developed a combined lecture/practical course to teach students current methods for the analysis of molecular sequence data.

International Bioinformatics Workshop on Virus Evolution and Molecular Epidemiology. I am part of the core faculty for this annual, week-long workshop in which students are introduced to the latest phylogenetic and genealogic methods to analyze molecular data from viruses.

Ethics in Genetics (Oxford University). I developed and taught an intensive four-week course in which students were challenged to tackle ethical dilemmas arising from modern scientific advances.

Biomolecular Evolution (Oxford University). I developed and taught a 3-week lecture/discussion course as part of the MSc in Archaeological Science, in which students are introduced to the basic concepts and application of ancient DNA.

Supervision:

My laboratory currently consists of two PhD students (J Cahill, N Schaffer), three Postdoctoral Research Associates (A Soares, D Chang, P Heintzman), two undergraduate researchers and a technician. At PSU, five undergraduate Honors theses were completed under my supervision.

Past students:

James Haile (PhD, Oxford, 2006)

Gabrielle Harrison (PhD, Oxford, 2007)

Brandon Letts (PhD, PSU, 2011)

Logan Kistler (PhD, PSU, 2012)

Conrad Stack 9PhD, PSU, 2013)

Kristine Korzow-Richter (PhD, PSU, 2014).

Publication List

In Press:

- (1) **Shapiro B**, Graham RD, Letts B. In press. A revised evolutionary history of armadillos (*Dasypus*) in North America based on ancient DNA. *Boreas*.
- (2) Molak M, Suchard MA, Ho SYW, Beilman D, **Shapiro B**. in press. Empirical calibrated radiocarbon sampler: a tool for incorporating radiocarbon-date and calibration error into Bayesian phylogenetic analyses of ancient DNA. *Molecular Ecology Resources*.
- (3) Kistler L, Montenegro A, Smith BD, Gifford JA, Green RE, Newsom LA, **Shapiro B**. In press. Transoceanic drift and the domestication of African bottle gourds in the Americas. *Proc Natl Acad Sci USA*.

Journal articles:

- (4) **Shapiro B**, Hofreiter M. 2014. A paleogenomic perspective on evolution and gene function: New insights from ancient DNA (invited review). *Science* 343: 1236573.
- (5) Horn S, Prost S, Stiller M, Makowiecki D, Kusnetsova T, Benecke N, Pucher E, Hufthammer AK, Schouwenburg C, **Shapiro B**, Hofreiter M. 2014. Ancient mitochondrial DNA and the genetic history of Eurasian beavers *Castor fiber*. *Molecular Ecology* 23: 1717-1729.
- (6) Der Sarkissian C, Emini L, Jónsson H, Alekseev A, Crubézy E, **Shapiro B**, Orlando L. 2014. Shotgun profiling of fossil remains. *Molecular Ecology* 23: 1780-1798.
- (7) Barnett R, Yamaguchi N, **Shapiro B**, Ho, SYW, Barnes I, Burger J, Sabin R, Werdelin L, Cuisin J, Larson G. 2014. Revealing the maternal demographic history of *Panthera leo* using ancient DNA and a spatially explicit genealogical analysis. *BMC Evolutionary Biology* 14: 80.
- (8) Harington CR, Cournoyer M, Chartier M, Fulton TL, **Shapiro B**. 2014. Brown bear (*Ursus arctos*) (9880±35 BP) from Lateglacial Champlain Sea deposits of Saint-Nicolas, Québec, Canada, and the dispersal history of bears. *Canadian Journal of Zoology* 51: 527-535.
- (9) **Shapiro B**, Ho SYW. 2014. Ancient hyaenas highlight the old problem of estimating evolutionary rates (Invited perspective). *Molecular Ecology* 23:499-501.
- (10) Thalmann O, **Shapiro B**, Schuenemann VJ, Sawyer SK, Greenfield DL, Germonpre MB, [23 others] Wayne RK. 2013. Complete mitochondrial genomes of ancient canids suggests a European origin of domestic dogs. *Science*. 342: 871-874.
- (11) Orlando L, Finolhac A, Zhang G, Froese D, [49 authors], **Shapiro B**, Jun W, Willerslev E. 2013. Recalibrating *Equus* evolution using the genome sequence of an early Middle Pleistocene horse. *Nature* 499: 74-78.
- (12) Green RE, **Shapiro B**. Human evolution: turning back the clock. 2013. *Current Biology* 23:R286-288.
- (13) Fulton TL, Norris RW, Graham RE, Semken HA Jr, **Shapiro B**. 2013. Ancient DNA supports southern survival of Richardson's collared lemming (*Dicrostonyx richardsoni*) during the Last Glacial Maximum. *Molecular Ecology* 22:2540-2548.
- (14) Cahill JA, Green RE, Fulton TL, Stiller M, Jay F, Ovsyanikov N, Salamzade R, St John J, Stirling I, Slatkin M, **Shapiro B**. 2013. Genomic evidence for island population conversion resolves conflicting theories of polar bear evolution. *PLoS Genetics* 9: e1003345.
- (15) Vilstrup JT, Sengouin-Orlando Am Stiller M, Ginolhac A, Raghavan M, Nielsen SCA, Weinstock J, Friese D, Vasiliev SK, Ovodov ND, Clary J, Helgen KM, Fleischer RC, Cooper A, **Shapiro B**, Orlando L. 2013. Mitochondrial phylogenomics of modern and ancient equids. *PLoS ONE* 8: e55950.
- (16) Gill MS, Lemey P, Faria NR, Rambaut A, **Shapiro B**, Suchard M. 2013. Improving Bayesian population dynamics inference: a coalescent-based model for multiple loci. *Molecular Biology and Evolution* 30: 713-724.
- (17) Molak M, Lorenzen ED, **Shapiro B**, Ho SYW. 2013. Phylogenetic estimation of timescales using ancient DNA: the effects of temporal sampling scheme and uncertainty in sample ages.

Molecular Biology and Evolution 30: 253-262.

- (18) Ginolhac A, Vilstrup J, Stenderup J, Rasmussen M, Stiller M, **Shapiro B**, Zazula G, Froese D, Steinmann KE, Thompson JD, AL-Rasheid KAS, Gilbert MTP, Willerslev E, Orlando L. 2012. Improving the performance of true single-molecule sequencing for ancient DNA. *BMC Genomics* 13:177.
- (19) Fischer A, **Shapiro B**, Muriuki C, Heller M, Schnee C, Bongcam-Rudloff E, Frey J, Jores J. 2012. The origin of the '*Mycoplasma mycoides* cluster' coincides with domestication of ruminants. *PLoS ONE* 7:e36150.
- (20) Widga C, Fulton TL, Martin LD, **Shapiro B**. 2012. *Homotherium* and *Cervalces* from the Great Lakes region, USA: geochronology, morphology and ancient DNA. *Boreas* 41: 546-556.
- (21) Dalén L, Orlando L, **Shapiro B**, Durling MB, Quam R, Gilbert MTP, Fernández-Lomana JCD, Willerslev E, Arsuaga JL, Götherström 2012. A. Partial genetic turnover in Neandertal: continuity in the east and population replacement in the west. *Molecular Biology and Evolution* 29: 1893-1897.
- (22) Letts B, **Shapiro B**. 2012. Case study: ancient DNA recovered from Pleistocene-age remains of a Florida armadillo. *Methods in Molecular Biology* 840: 87-92.
- (23) Fulton TL, Wagner SM, **Shapiro B**. 2012. Case study: recovery of ancient nuclear DNA from toe pads of the extinct passenger pigeon. *Methods in Molecular Biology* 840: 29-35.
- (24) MacDonald GM, Beilman DW, Kuzmin YV, Orlova LA, Kremenetski KV, **Shapiro B**, Wayne RK, Van Valkenburgh B. 2012. Pattern of extinction of the woolly mammoth in Beringia. *Nature Communications* 3: 893.
- (25) Letts B, Fulton TL, Stiller M, Andrews T, MacKay G, Popkp R, **Shapiro B**. 2012. Ancient DNA reveals genetic continuity in woodland caribou of the Central Mackenzie Mountains, Northwest Territories, Canada. *Arctic* 65, Suppl 1: 80-94.
- (26) Fulton TL, Wagner SM (PSU undergrad), Fisher C, **Shapiro B**. 2012. Nuclear DNA from the extinct passenger pigeon (*Ectopistes migratorius*) confirms its phylogenetic placement within the Columbinae. *Annals of Anatomy* 194: 52-57.
- (27) Fulton T, Letts B, **Shapiro B**. 2012. Multiple losses of flight and recent speciation in steamer ducks. *Proceedings of the Royal Society B* 279: 2339-2346.
- (28) Higham T, Compton T, Stringer C, Jacobi R, **Shapiro B**, Trinkaus E, Chandler B, Gröning F, Collins C, Hillson S, O'Higgins P, Fagan M. 2011. The earliest evidence for anatomically modern humans in northwestern Europe. *Nature* 479: 521-524.
- (29) Orlando L, Ginolhac A, Raghavan M, Vilstrup J, Rasmussen M, Magnussen K, Steinmann K, Kapranov P, Thompson JF, **Shapiro B**, Zazula G, Froese D, Hofreiter M, Al-Rasheid KAS, Mundy J, Gilbert MTP, Willerslev E. 2011. Single-molecule ancient DNA sequencing of a Pleistocene horse bone. *Genome Research* 21: 1705-1719.
- (30) Lorenzen ED, Nogues-Bravo D, Orlando L, Weinstock J, Binladen J, Marske KA, 52 additional authors, **Shapiro B**, Rahbek C, Willerslev E. 2011. Species-specific responses of Late Quaternary megafauna to climate and humans. *Nature* 479: 359-364.
- (31) Edwards CJE, Suchard MA, Lemey P, Welch JJ, Barnes I, Fulton TL, Barnett R, O'Connell TC, Coxon P, Monaghan N, Valdiosera C, Lorenzen ED, Willerslev E, Baryshnikov GF, Rambaut A, Thomas MG, Bradley DG, **Shapiro B**. 2011. Ancient hybridization and a recent Irish origin for the modern polar bear matriline. *Current Biology* 21: 1-8.
- (32) Kistler L, **Shapiro B**. 2011. Ancient DNA confirms a local origin of domesticated chenopod in Eastern North America. *J. Arch. Sci.* 38: 3459-3554.
- (33) Lippold S, Knapp M, Kuznetsova T, Leonard JA, Benecke N, Ludwig A, Rasmussen M, Weinstock J, Willerslev E, Shapiro B, Hofreiter M. 2011. Discovery of lost diversity of paternal horse lineages using ancient DNA. *Nature Comm.* 2:450.
- (34) Workman C, Dalen L, Vartanyan S, **Shapiro B**, Kosintev P, Sher A, Götherstrom A, Barnes I. 2011. Population-level genotyping of coat colour polymorphism in woolly mammoth (*Mammuthus primigenius*). *Quat. Sci. Rev.* 30: 2304-2308.

- (35) Ho SYW, Lanfear R, Phillips MJ, Barnes I, Thomas JA, Kolokotronis S-O, **Shapiro B**. 2011. Bayesian estimation of substitution rates from ancient DNA sequences with low information content. *Syst. Biol.* 60: 366-375.
- (36) Ho SYW, **Shapiro B**. 2011. Skyline-plot methods for estimating demographic history from nucleotide sequences *Mol. Ecol. Res.* 11: 423-434.
- (37) Harrison GL, Lemey P, Hurles M, Moyes C, Horn S, Pryor J, Malani J, Supuri M, Masta A, Teriboriki B, Toatu T, Penny D, Rambaut A, **Shapiro B**. 2011. Genomic analysis of Hepatitis B Virus reveals antigen state and genotype as source of evolutionary rate variation. *Viruses* 3: 83-101.
- (38) **Shapiro B**, Ho SYW, Drummond AJ, Suchard MA, Pybus O, Rambaut A. 2011. A Bayesian phylogenetic method to estimate unknown sequence ages. *Mol. Biol. Evol.* 28: 879-887.
- (39) Firth C, Kitchen A, **Shapiro B**, Suchard MA, Holmes EC, Rambaut A. Using time-structured data to estimate evolutionary rates of double-stranded DNA viruses. *Mol. Biol. Evol.* 27: 2038-2051.
- (40) **Shapiro B**, Hofreiter M. 2010. The analysis of ancient human genomes: using next generation sequencing, 20-fold coverage of the genome of a 4,000-year-old human from Greenland has been obtained. *Bioessays* 32: 388-391.
- (41) Stack JC, Welch D, Ferrari MJ, **Shapiro B**, Grenfell BT. 2010. Protocols for sampling viral sequences to study epidemic dynamics. *J. Roy. Soc. Interface* 7: 1119-1127.
- (42) Campos P, Willerslev E, Sher A, Axelsson E, Tikhonov A, Aaris-Sørensen K, Greenwood A, Kahlke R-D, Kosintsev P, Krakhmalnaya T, Kuznetsova T, Lemey P, MacPhee RD, Norris CA, Shepherd K, Suchard MA, Zazula GD, **Shapiro B**, Gilbert MTP. 2010. Ancient DNA analysis excludes humans as the driving force behind late Pleistocene musk ox (*Ovibos moschatus*) population dynamics. *Proc. Natl. Acad. Sci. USA* 107: 5675-5680.
- (43) Kuhn TS, McFarlane K, Groves P, Moers AO, **Shapiro B**. 2010. Modern and ancient DNA reveal recent partial replacement of caribou in the southwest Yukon. *Mol. Ecol.* 19: 1312-1318.
- (44) Haile J, Larson G, Owens K, Dobney K, **Shapiro B**. 2010. Ancient DNA typing of Archaeological Pig Remains Corroborates Historical Records. *J. Arch. Sci.* 37:174-177.
- (45) Edwards CJ, Magee DA, Park SD, McGettigan PA, Lohan AJ, Murphy A, Finlay EK, **Shapiro B**, Chamberlain AT, Richards MB, Bradley DG, Loftus BJ, Machugh DE. 2010. A complete mitochondrial genome sequence from a mesolithic wild aurochs (*Bos primigenius*). *PLoS One* 5:e9255.
- (46) Magiorkinis G, Magiorkinis E, Paraskevis D, Ho SYW, **Shapiro B**, Pybus O, Allain JP, Hatzakis A. 2009. The global spread of Hepatitis C Virus 1a and 1b: a phylodynamic and phylogeographic analysis *PLoS Med.* 6:e1000198.
- (47) Cordingly JE, Sundaresan SR, Larison BJ, **Shapiro B**, Rubenstein DI. 2009. Grevy's zebra conservation: overcoming threats of isolation, genetic hybridization and demographic instability. *Anim. Conserv.* 12 520-521.
- (48) Bunce M, Worthy T, Phillips M, Holdaway R, Willerslev E, Haile J, **Shapiro B**, Scofield P, Drummond A, Kamp P, Cooper A. 2009. The evolutionary history of the extinct ratite moa and New Zealand Neogene paleogeography. *Proc. Natl. Acad. Sci. USA* 106: 20646-20651.
- (49) Ramsden C, Charleston MA, Duffy S, **Shapiro B**, Holmes EC. 2009. Insights into the evolutionary history of an emerging livestock pathogen: Porcine Circovirus 2. *J. Virol.* 83: 12813-12821.
- (50) Cordingly JE, Sundarisan SR, Fischhoff IR, **Shapiro B**, Ruskey J, Rubenstein DI. 2009. Is the endangered Grevy's zebra threatened by hybridization? *Anim. Conserv.* 12: 505-513.
- (51) Zazula GD, MacKay G, Andrews TD, **Shapiro B**, Letts B, Brock F. 2009. A Late Pleistocene steppe bison (*Bison priscus*) partial carcass from Tsiigehtchic, Northwest Territories, Canada. *Quat. Sci. Rev.* 28: 2734-2742.
- (52) Collins MJ, Penkman KEH, Rohalnd N, **Shapiro B**, Dobberstein RC, Rotz-Timme A, Hofretier M. 2009. Is amino acid racemization a useful tool for screening for ancient DNA in bone? *Proc. Roy. Soc. B* 276: 2971-2977.

- (53) Weinstock J, **Shapiro B**, Prieto A, Martin JC, Gonzáles BA, Gilbert MPT, Willerslev E. 2009. The Late Pleistocene distribution of vicuñas (*Vicugna vicugna*) and the “extinction” of the gracile llama (*Lama gracilis*): new molecular data. *Quat. Sci. Rev.* 28: 15-16.
- (54) Barnett R, **Shapiro B**, Ho SYW, Barnes I, Burger J, Yamaguchi N, Higham T, Wheeler, HT, Rosendhal W, Sher AV, Baryshnikov G, Cooper A. 2009. Phylogeography of lions (*Panthera leo*) reveals three distinct taxa and a Late Pleistocene reduction in genetic diversity. *Mol. Ecol.* 18: 1668-1677.
- (55) Rambaut A, Drummond AJ, Ho SYW **Shapiro B**. 2009. Accommodating the effect of ancient DNA damage on inferences of demographic histories. *Mol. Biol. Evol.* 26: 245-248.
- (56) Rijdsdijk KF, Hume JP, Bunnik F, Florens V, Baider C, **Shapiro B**, et al. 2009. Mid-Holocene vertebrate bone Concentration Lagerstätte on oceanic island Mauritius provides a window into the ecosystem of the dodo (*Raphus cucullatus*). *Quat. Sci. Rev.* 28: 14-24.
- (57) Wilson M, **Shapiro B**, Hills LV. 2008. Late Pleistocene northward-dispersing *Bison antiquus* from the Bighill Creek Formation, Gallelli Gravel Pit, Alberta, Canada, and the fate of *Bison occidentalis*. *Can. J. Earth Sci.* 45: 827-859.
- (58) Dalén L, Götherström A, **Shapiro B**. 2008. Recovery of DNA from footprints in the snow. *Can. Field Nat.* 12: 321-324.
- (59) **Shapiro B**. 2008. Engineered polymerases amplify the potential of ancient DNA. *Trends Biotech.* 26: 285-287.
- (60) Ho SYW, Larson G, Edwards CJ, Heupink TH, Lain KE, Holland PWH, **Shapiro B**. 2008. Correlating Bayesian date estimates with climatic events and domestication using a bovine case study. *Biol. Lett.* 274: 1377-1385.
- (61) Ho SYW, Saarma U, Barnett R, Haile J, **Shapiro B**. T 2008. The effect of inappropriate calibration in molecular ecological studies: three case studies *PLoS ONE* 3: e1615.
- (62) Barnett R, Yamaguchi N, **Shapiro B**, Sabin R. 2008. Ancient DNA analysis indicates the first English lions originated from North Africa, *Contrib. Zool.* 77: 7-16.
- (63) Kapoor A, **Shapiro B**, Shafer RW, Rhee S-Y, Delwart EL. 2008. Multiple independent origins of protease inhibitor resistance mutation in salvage therapy patients. *Retrovirology* 5: 7.
- (64) Buckley M, Walker A, Ho SYW, Yang Y, Smith C, Ashton P, Oates JT, Cappellini E, Koonn H, Penkman K, Elsworth B, Ashford D, Solazzo C., Andrews P, Strahler J, **Shapiro B**, Ostrom P, Gandhi H, Miller W, Raney B, Zylber MI, Gilbert MTP, Prigodich RV, Ryan M, Rijdsdijk KF, Janoo A, Collins M. 2008. Comment on “Protein sequences from Mastodon and *Tyrannosaurus rex* revealed by mass spectrometry” *Science* 319: 33.
- (65) Barnett R, Yamaguchi N, **Shapiro B**, Nijman V. 2007. Using ancient DNA techniques to identify the origin of an unprovenanced museum specimen, as illustrated by the identification of a 19th century lion from Amsterdam, *Contrib. Zool.* 76: 87-94.
- (66) Deforche K, Camacho, R., Laethem, KV, **Shapiro B**., Moreau Y, Rambaut A, Vandamme, AM, Lemey P. 2007. Estimating the relative contribution of dNTP pool imbalance and APOBEC3G/3F editing to HIV evolution in vivo. *J. Comp. Biol.* 14: 1105-1114.
- (67) Abecasis AB, Lemey P, Vidal N, de Oliveira T, Peeters M, Camacho R, **Shapiro B**, Rambaut A, Vandamme A-M. 2007. Recombination is confounding the early evolutionary history of HIV-1: subtype G is a recombinant. *J. Virol.* 81: 8543-51.
- (68) Ho SYW, **Shapiro B**, Phillips MJ, Cooper A, Drummond AJ. 2007. Evidence for time dependency of molecular rate estimates. *Sys. Biol.* 56: 515-522.
- (69) Barnes I, **Shapiro B**, Kuznetsova T, Sher A, Guthrie D, Lister A, Thomas MG. 2007. Genetic structure and extinction of the woolly mammoth. *Curr. Biol.* 17: 1072-1075.
- (70) Ho SYW, Heupink, TH, Rambaut, A, **Shapiro B**. 2007. Bayesian estimation of sequence damage in ancient DNA. *Mol. Biol. Evol.* 24:1416-1422.
- (71) Edwards CJ, Bollongino R, Scheu A, Chamberlain A, Tresset A, Vigne J-D, Baird JF, Larson G, Ho SYW, Heupink TH, **Shapiro B**, Freeman AR, et al. 2007. Mitochondrial DNA analysis shows a Near Eastern Neolithic origin for domestic cattle and no indication of domestication of

- European aurochs. *Proc. Roy. Soc B.* 274: 1377-1385.
- (72) Rector A, Lemey P, Tachezy R, Mostmans S, Ghim S, Van Doorslaer K, Roelke M, Bush M, Montali RJ, Joslin J, Burk R, Jenson A, Sundberg JP, **Shapiro B**, Van Ranst M. 2007. Ancient papillomavirus-host co-speciation in Felidae. *Genome Biol.* 8:R57.
- (73) Haile J, Holdaway R, Oliver K, Bunce M, Gilbert MTP, Nielsen R, Munch K, Ho, SYW, **Shapiro B**, Willerslev E. 2007. Ancient DNA chronology within sediment deposits: is DNA leaching a factor? *Mol. Biol. Evol.* 24: 982-989.
- (74) Lemey P, Kosakovsky-Pond SL, Drummond A, Pybus O, **Shapiro B**, Barroso H, Taveira N, Rambaut A. 2007. Synonymous substitution rates predict HIV disease progression as a result of underlying replication dynamics. *PLoS Comp. Biol* 3:e29.
- (75) **Shapiro B**, Rambaut A, Gilbert MTP. 2006. No proof that typhoid caused the Plague of Athens. *Int. J Infect. Dis.* 10:334-335.
- (76) **Shapiro B**, Rambaut A, Drummond AJ. 2006. Choosing appropriate substitution models for the phylogenetic analysis of protein-coding sequences *Mol. Biol. Evol.* 23: 7-9.
- (77) Poinar HN, Schwartz C, Qi J, **Shapiro B**, MacPhee RD, Buiges B, Tikhonov A, Huson D, Tonsho L, Auch A, Rapp M, Miller W, Schuster SC. 2006. Metagenomics to paleo-genomics: large scale sequencing of mammoth DNA. *Science* 311: 392-394.
- (78) **Shapiro B**, Drummond AJ, Rambaut A, Pybus OJ, Holmes EC. 2006. A phylogenetic method for detecting positive epistasis in gene sequences and its application to RNA virus evolution. *Mol. Biol. Evol* 23:1724-1730.
- (79) Gilbert MTP, **Shapiro B**, Drummond A, Cooper A. 2005. Post-mortem DNA damage hotspots in Bison (*Bison bison* and *B. bonasus*) provide supporting evidence for mutational hotspots in human mitochondria. *J. Arch. Sci.* 32:1053-1060.
- (80) Drummond AJ, Pybus OG, **Shapiro B**, Rambaut A. 2005. Bayesian coalescent inference of past population dynamics from molecular sequences. *Mol. Biol. Evol.* 22:1185-1192.
- (81) Bunce M, Szulkin M, Lerner HRL, Barnes I, **Shapiro B**, Cooper A, Holdaway RN. 2005. Ancient DNA provides new insights into the evolutionary history of New Zealand's extinct giant eagle. *PLoS Biol.* 3(1) e20.
- (82) **Shapiro B**, Drummond AJ, Rambaut A, Wilson MC, Matheus P, Sher AV, Pybus OG, *et al.* 2004. Rise and fall of the Beringian steppe bison. *Science* 306: 1561-1565.
- (83) Gilbert MTP, Wilson AS, Bunce M, Hansen AJ, Willerslev E, **Shapiro B**, Higham TFG, Richards MP, O'Connell TC, Tobin DJ, Janaway RC, Cooper A. 2004. Ancient mitochondrial DNA from hair. *Curr. Biol.* 14: R463-464.
- (84) **Shapiro B**, Cooper A. 2003. Beringia as an Ice Age genetic museum. *Quat. Res.* 60: 94- 100.
- (85) Willerslev E, Hansen AJ, Binladen J, Brand TB, Gilbert MTP, **Shapiro B**, Bunce M, Wiuf C, Gilichinsky DA, Cooper A. 2003. Diverse plant and animal genetic records from Holocene and Pleistocene sediments. *Science* 300: 791-795.
- (86) Nielsen-Marsh, CM, Ostrom PH, Gandhi H, **Shapiro B**, Cooper A, Collins MJ. 2002. Exceptional preservation in >55 ka BP bison bones demonstrated by protein and DNA sequences. *Geology* 30: 1099-1102 .
- (87) Lalueza-Fox, C, **Shapiro B**, Bover P, Alcover JA, Bertranpetit J. 2002. Molecular phylogeny and evolution of the extinct bovid *Myotragus*. *Mol. Phyl. Evol.* 25 (3): 501-510.
- (88) **Shapiro B**, Sibthorpe D, Austin J, Wragg G, Lee PLM, Bininda-Emonds ORP, and Cooper A. 2002. Flight of the Dodo. *Science* 295: 1683.
- (89) Barnes I, Matheus P, **Shapiro B**, Jensen D, Cooper A. 2002. Dynamics of mammal population extinctions in eastern Beringia during the last glaciation. *Science* 295: 2267-2270.
- (90) Beck CW, **Shapiro B**, Choksi S, Promislow DEL. 2002. A genetic algorithm approach to study the evolution of female preference based on male age. *Evol. Ecol. Res* 4: 275-292.
- (91) **Shapiro BA**, Pickering J. 2000. Rainfall and parasitic wasp (Hymenoptera: Ichneumonoidea) activity in successional forest stages at Barro Colorado Nature Monument, Panama and La Selva Biological Station, Costa Rica. *Agr. For. Ent.* 2: 39-47.

Book reviews:

- (1) **Shapiro, B.** Book review: Reading the story in DNA by Lindell Bromham. *Quart. Rev. Biol.* 85: 223.
- (2) **Shapiro B.** Book review: Return of the Crazy Bird: the Sad, Strange Tale of the Dodo by Clara Pinto-Correia. *Quart. Rev. Biol.* 79: 197-198.

Book chapters:

- (1) Shapiro B. Reconstructing the past: Ancient DNA. Princeton Guide to Evolution. Losos, J. Ed. Princeton University Press. (In press).
- (2) Shapiro B, Gilbert MTP, Barnes I. Using DNA to investigate human evolution. *In* H Schutkowski, *Between Biology and Culture*. Cambridge University Press.
- (3) Pybus OG, Shapiro B. Natural selection and adaptation of molecular sequences. *In* Lemey P, Salemi N, Vandamme A-M. *The Phylogenetics Handbook*. Cambridge Univ. Press.
- (4) Barnett R, Shapiro B, Barnes I. Ancient DNA from vertebrate fossils. *In* Elias SA, Ed. *Encyclopedia of Quaternary Science*. Elsevier.

Books:

- (1) Shapiro B, Hofreiter M (Eds). *Ancient DNA. Methods in Molecular Biology*. Humana Press..
- (2) Shapiro, B. *De-Extinct: How to Clone a Mammoth*. Princeton University Press (In prep).

Current External Research Support

NSF ARC-1203990 Collaborative Research: Paleoclimate, Paleoenvironment and Other Potential Drivers of Extinction of *Mammuthus primigenius*, St. Paul Island, Pribilof Islands, Alaska.. \$287,846. National Science Foundation. Co-PIs: R Graham (PSU); M Wooller (UAF); J Williams (UWisc-Mad). (02/01/13-01/31/16).

Revealing virus origins using ancient DNA. \$875,000. David and Lucille Packard Foundation. (10/13/10-10/12/15).

Assessing DNA preservation in archival material. \$60,000. The Smithsonian Institution. (01/01/13-12/31/13).

PSARCI: Signatures of life from Earth and beyond. \$2.8M. Role: Co-I (one of 17). NASA Astrobiology Institute. C House (PSU) PI. (02/01/09-01/31/14).

Past External Research Support

DNA from ancient fecal pellets: Using rapidly evolving markers to reconstruct recent evolutionary dynamics of pathogens and their hosts. \$300,000. Searle Scholars Program. (07/01/09-06/30/13).

NSF ARC-0909456. Collaborative research: Understanding the role of environmental change on the long-term population dynamics of two extinct and one surviving arctic species. \$267,758. National Science Foundation. CO-Is: R Wayne (UCLA) E Post (PSU) M Wooller (UAF). (08/01/09-07/31/12)

Assessing the role of the changing arctic environment on the genetic structure and temporal stability of polar bears. NASA; Pennsylvania Space Grant Consortium. \$5000. (2009-2010).

NIH R01 GM083983-01. Synthesizing the evolution and ecological dynamics of acute RNA viruses: Comparative analyses and methods development. Role: Co-I. B. Grenfell (Princeton) PI. (2006-2011).

NIH R01 GM083601-01. Novel statistical models for synthesizing social networks and epidemic dynamics. Role: Co-I. David Hunter (PSU) PI (2007-2012).

Melting treasure: Recovering 700,000 years of evolutionary history from melting permafrost in the Yukon. \$20,300 National Geographic. Role: PI.

Videos and interviews available online:

A short video take on what I do:

http://poptech.org/popcasts/quick_takes_beth_shapiro

And how I “live curious”:

<http://video.nationalgeographic.com/video/specials/in-the-field-specials/curiosity-beth-shapiro/>

Longer talks/seminars

TEDxDeExtinction:

Ancient DNA: What it is, and what it could be
National Geographic Society, Washington D.C.

<http://longnow.org/revive/tedxdeextinction/ancient-dna-what-it-is-and-what-it-could-be/>

Pop!Tech:

Understanding Extinction

Swedish Embassy, Washington D.C

http://poptech.org/popcasts/beth_shapiro_species_extinction

Pop!Tech:

What goes extinct?

Pop!Tech annual meeting

http://poptech.org/popcasts/beth_shapiro_what_goes_extinct

World Science Festival:

Cool Jobs

http://worldsciencefestival.com/participants/beth_shapiro



Radio, TV, and documentaries:

Die Trying: Hunt for the Superbear. 90 Miles Productions for National Geographic TV. Release Date: Upcoming.

Undoing Forever. CBC Radio One *IDEAS*. Release date: 19 June 2014.

Reawakening Extinct Species. KQED *QUEST*. Release date: 23 April 2014.

The Dodo's Guide to Surviving Extinction. BBC. Release date: 4 November 2007.

Extinct. Wall to Wall TV. Release date: 25 September 2001.