

# Kirsten I. Bos

## Curriculum Vitae

Max Planck Institute for the Science of Human History  
Kahlaische Str. 10  
Jena, Germany  
07745

Email: bos[at]shh.mpg.de

Citizenship: Canadian

### Academic Affiliation

Group Leader, Molecular Palaeopathology  
Max Planck Institute for the Science of Human History

**Research Interests:** palaeopathology, infectious disease, ancient DNA, skeletal biology, microbiology, disease resistance

### Education

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| 2011 | Doctor of Philosophy, Department of Anthropology, McMaster University<br>Thesis title: <i>Genetic investigations into the Black Death</i><br>Supervisory committee: Hendrik Poinar (advisor),<br>D. Ann Herring, G. Brian Golding  |
| 2006 | Ph.D. comprehensive examination completed, "with distinction"  |
| 2004 | Master of Arts, Department of Anthropology, McMaster University<br>Thesis title: <i>Trinitapoli: a preliminary evaluation of the human skeletal material recovered from a Middle Bronze Age burial site in southern Italy</i><br>Supervisory committee: Shelley R. Saunders (advisor),<br>D. Ann Herring, Anne Keenleyside |

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|------|---|
| 2002 | pre-Master's year, University of Manitoba, Department of Anthropology<br>Supervisor: Robert D. Hoppa                |
| 2001 | Honours Bachelor of Science "with distinction",<br>Specialized Honours Bio-medical Science,<br>University of Guelph |

## **Grants and fellowships**

*Currency shown in Canadian dollars*

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|------|---|
| 2011 | SSHRC postdoctoral fellowship (24 months) (\$81,000)                    |
| 2009 | McMaster University Graduate Student Association Travel Grant (\$500)   |
| 2008 | McMaster University Graduate Fellowship (PhD level) (\$10,000)          |
| 2004 | SSHRC Canada Graduate Scholarship (PhD level) (\$105,000)               |
| 2004 | Ontario Graduate Scholarship (\$15,000), declined                       |
| 2003 | McMaster University Graduate Student Association Travel Grant (\$200)   |
| 2003 | SSHRC Canada Graduate Scholarship (Master's level) (\$17,500)           |
| 2003 | Ontario Graduate Scholarship (\$15,000), declined                       |
| 2003 | Italian Government "Borsa di studio" (\$1838)                           |
| 2002 | McMaster University Graduate Fellowship (\$4000)                        |
| 2002 | McMaster University Dept. of Anthropology entrance scholarship (\$2000) |

## Employment

2015 – present	Group Leader, Max Planck Institute for the Science of Human History
2014 – 2015	Postdoctoral researcher, University of Tuebingen
2001 – 2012	Principal oboe, Guelph Symphony Orchestra
2002 – 2010	McMaster University teaching assistant, Dept. of Anthropology
2004 – 2008	Editorial assistant, International Journal of Osteoarchaeology
2001	Research assistant, University of Manitoba, Department of Anthropology
2000	National Research Council of Canada summer student

## Refereed Journal Publications

2015	<b>Kirsten I. Bos*</b> , Günter Jäger*, Verena J. Schuenemann, Åshild J. Vågane, Maria A. Spyrou, Alexander Herbig, Kay Nieselt, and Johannes Krause. Parallel detection of ancient pathogens via array-based DNA capture <i>Phil. Trans. R. Soc. B</i> <b>370</b> (1660) (19 January 2015) doi: 10.1098/rstb.2013.0375.
2015	Kelly M. Harkins, Jane E. Buikstra, Tessa Campbell, <b>Kirsten I. Bos</b> , Eric D. Johnson, Johannes Krause, and Anne C. Stone. Screening ancient tuberculosis with qPCR: challenges and opportunities <i>Phil. Trans. R. Soc. B</i> <b>370</b> (1660) (19 January 2015) doi: 10.1098/rstb.2013.0622
2014	<b>Kirsten I. Bos*</b> †, Kelly M. Harkins*, Alexander Herbig*, Mireia Coscolla*, Nico Weber, Iñaki Comas, Stephen A. Forrest, Josephine M. Bryant, Simon R. Harris, Verena J. Schuenemann, Tessa J. Campbell, Kerstu Majander, Alicia K. Wilbur, Ricardo A. Guichon, Dawnie L. Wolfe Steadman, Della Collins Cook, Stefan Niemann, Marcel A. Behr, Martin Zumarraga, Ricardo Bastida, Daniel Huson, Kay Nieselt, Douglas Young, Julian Parkhill, Jane E. Buikstra, Sebastien Gagneux, Anne C. Stone†, and Johannes Krause†. Pre-Columbian Mycobacterial Genomes Reveal Seals as a Source of New World Human Tuberculosis. <i>Nature</i> ; 514(7523):494-497.

- 2014 Iosif Lazaridis, Nick Patterson, Alissa Mittnik, Gabriel Renaud, Swapan Mallick, Karola Kiršanow, Peter H. Sudmant, Joshua G. Schraiber, Sergi Castellano, Mark Lipson, Bonnie Berger, Christos Economou, Ruth Bollongino, Qiaomei Fu, **Kirsten I. Bos**, ... , Svante Pääbo, Janet Kelso, David Reich, and Johannes Krause. Ancient human genomes suggest three ancestral populations for present-day Europeans. *Nature*; 513(7518):409–413.
- 2014 Alison M. Devault, M.A., G. Brian Golding, Ph.D., Nicholas Waglechner, M.Sc., Jacob M. Enk, M.Sc., Melanie Kuch, M.Sc., Joseph H. Tien, Ph.D., Mang Shi, M.Phil., David N. Fisman, M.D., M.P.H., Anna N. Dhody, M.F.S., Stephen Forrest, M.Sc., **Kirsten I. Bos, Ph.D.**, David J.D. Earn, Ph.D., Edward C. Holmes, Ph.D., and Hendrik N. Poinar, Ph.D. Second-Pandemic Strain of *Vibrio cholerae* from the Philadelphia Cholera Outbreak of 1849. *N Engl J Med*; 370:334–340
- 2013 Verena J. Schuenemann\*, Pushpendra Singh\*, Thomas A. Mendum\*, Ben Krause-Kyora\*, Günter Jäger\*, Kirsten I. Bos, Alexander Herbig, Christos Economou, Andrej Benjak, Philippe Busso, Almut Nebel, Jesper L. Boldsen, Anna Kjellström, Huihai Wu, Graham R. Stewart, G. Michael Taylor, Peter Bauer, Oona Y.-C. Lee, Houdini H.T. Wu, David E. Minnikin, Gurdyal S. Besra, Katie Tucker, Simon Roffey, Samba O. Sow, Stewart T. Cole, Kay Nieselt, and Johannes Krause. Genome-Wide Comparison of Medieval and Modern *Mycobacterium leprae*. *Science*; 341(6142):179–183.
- 2013 Qiaomei Fu\*, Alissa Mittnik\*, Philip L.F. Johnson, **Kirsten Bos**, Martina Lari, Ruth Bollongino, Chengkai Sun, Liane Giemsch, Ralf Schmitz, Joachim Burger, Anna Maria Ronchitelli, Fabio Martini, Renata G. Cremonesi, Jiří Svoboda, Peter Bauer, David Caramelli, Sergi Castellano, David Reich, Svante Pääbo and Johannes Krause. A revised timescale for human evolution based on ancient mitochondrial genomes. *Current Biology*; Volume 23, Issue 7: 553–559.
- 2012 **Kirsten I. Bos**, Philip Stevens, Kay Nieselt, Hendrik N. Poinar, Sharon N. DeWitte, and Johannes Krause. *Yersinia pestis*: new evidence for an old infection. *PLOS ONE*; Volume 7, Issue 11, e49803. doi:10.1371/journal.pone.0049803.

- 2011 **Kirsten I. Bos\***, Verena J. Schuenemann\*, G. Brian Golding, Hernan A. Burbano, Nicholas Waglechner, Brian K. Coombes, Joseph B. McPhee, Sharon N. DeWitte, Matthias Meyer, Sarah Schmedes, James Wood, David J. D. Earn, D. Ann Herring, Peter Bauer, Hendrik N. Poinar & Johannes Krause. A draft genome of *Yersinia pestis* from victims of the Black Death. *Nature*; Volume 478:506 – 510. doi:10.1038/nature10549.
- 2011 Schuenemann VJ\*, **Bos KI\***, DeWitte SN, Schmedes S, Jamieson J, Mitnik A, Forrest SA, Coombes B, Wood JW, Earn D, White Wi, Krause, and Poinar HN (2011). Targeted enrichment of ancient pathogens yielding the pPCP1 plasmid of *Yersinia pestis* from victims of the Black Death. *Proceedings of the National Academy of Sciences*; doi/10.1073/pnas.1105107108.
- 2010 John BA Okello, Linda Rodriguez, Debi Poinar, **Kirsten Bos**, Andrew L. Okwi, Gabriel S Bimenya, Nelson K Sewankambo, Kenneth R Henry, Hendrik N Poinar. Quantitative Assessment of the Sensitivity of Various Commercial Reverse Transcriptases Based on Armored HIV RNA. *PLoS ONE*; Volume 5, Issue 11, e13931. doi:10.1371/journal.pone.0013931.
- 2009 Linda Y. Rutledge, **Kirsten I. Bos**, Robert J. Pearce, Bradley N. White. Genetic and morphometric data from 16th century skull fragments support the eastern wolf as a distinct species from the gray wolf. *Conservation Genetics*; Volume 11, Issue 4:1273-1281.
- 2009 Hendrik Poinar, Stuart Fiedel, Christine E. King, Alison M. Devault, **Kirsti Bos**, Melanie Kuch, Regis Debruyne. Comment on "DNA from Pre-Clovis Human Coprolites in Oregon, North America". *Science*; Volume 325 Issue 5937:148.
- 2008 Regis Debruyne, Genevieve Chu, Christine E. King, **Kirsti Bos**, Melanie Kuch, Carsten Schwarz, Paul Szpak, Darren R. Gröcke, Paul Matheus, Grant Zazula, Dale Guthrie, Duane Froese, Bernard Buigues, Christian de Marliave, Clare Flemming, Debi Poinar, Daniel Fisher, John Southon, Alexei N. Tikhonov, Ross D.E. MacPhee and Hendrik N. Poinar. Out of America: Ancient DNA Evidence for a New World Origin of Late Quaternary Woolly Mammoths. *Current Biology*; Volume 18, Issue 17:1320-1326.

## Published Abstracts/Professional Meeting Presentations

- 2015      Johannes Krause, **Kirsten Bos**, Alexander Herbig, Sebastien Gagneux, Jane Buikstra, and Anne C. Stone. Ancient *Mycobacterium tuberculosis* genomes suggest re-adaptation to pre-Columbian human populations. Invited talk presented at the 2015 meeting for the Society for Molecular Biology and Evolution, Vienna, Austria.
- 2015      Maria Spyrou, Åshild Vågane, Luca Bondioli, Alessandra Sperduti, **Kirsten I. Bos**, and Johannes Krause. Investigation of mitochondrial DNA diversity in early medieval Southern Italy. Poster presented at the 2015 meeting for the Society of Molecular Biology and Evolution, Vienna, Austria.
- 2015      Alexander Herbig, Frank Maixner, **Kirsten Bos**, Benjamin Buchfink, Chao Xie, Albert Zink, Johannes Krause, and Daniel Huson. Ultra-fast alignment and analysis of metagenomic DNA sequence data from the Tyrolean Iceman. Poster presented at the 2015 meeting of the Society for Molecular Biology and Evolution, Vienna, Austria.
- 2015      **Kirsten I. Bos**, Kelly M. Harkins, Alexander Herbig, Sebastien Gagneux, Jane E. Buikstra, Anne C. Stone, and Johannes Krause. *Mycobacterium tuberculosis* genomes from the pre-Columbian New World suggest a marine route of disease transmission. Presented at the 42nd annual meeting of the Paleopathology Association, St. Louis Missouri, United States.
- 2014      **Kirsten I. Bos**, Kelly M. Harkins, Alexander Herbig, Jane E. Buikstra, Sebastien Gagneux, Anne C. Stone, and Johannes Krause. Analyses of *Mycobacterium tuberculosis* genomes from the pre-contact New World using high throughput sequencing. Presented at the 20<sup>th</sup> Paleopathology Association Meeting, Lund, Sweden.
- 2014      **Kirsten I. Bos**, Kelly M. Harkins, Alexander Herbig, Jane E. Buikstra, Sebastien Gagneux, Anne Stone, and Johannes Krause. A preliminary evaluation of *Mycobacterium tuberculosis* in the pre-contact New World using high throughput sequencing. Presented at the 83<sup>rd</sup> annual meeting of the American Association for Physical Anthropologists, Calgary, Alberta.

- 2013 **Kirsten I. Bos**, Johannes Krause. Palaeopathology in the era of high throughput sequencing. Presented at the 15<sup>th</sup> annual conference for the British Association for Biological Anthropology and Osteoarchaeology, York, United Kingdom.
- 2013 **Kirsten I. Bos**, Johannes Krause. Genetic investigations of *Y. pestis* from archaeological populations. Presented at Cold Spring Harbor Asia, Yersinia 11, Suzhou, China.
- 2013 **Kirsten I. Bos**, Johannes Krause. Ancient pathogen DNA: protocols, progress, and possibilities. Presented at the 78<sup>th</sup> annual meeting for the Society of American Archeology, Honolulu, Hawaii.
- 2013 **Kirsten I. Bos**, Johannes Krause. The evolutionary history of *Yersinia pestis*. Presented at the 82<sup>nd</sup> annual meeting of the American Association for Physical Anthropologists, Knoxville, Tennessee.
- 2012 **Kirsten I. Bos**, Verena J. Schuenemann, Sharon N. DeWitte, Hendrik N. Poinar, and Johannes Krause. A draft genome of *Yersinia pestis* from victims of the Black Death. Presented at the European Meeting of the Paleopathology Association, Lille, France.
- 2012 **Kirsten I. Bos**, Verena J. Schuenemann, G. Brian Golding, Hernàn A. Burbano, Nicholas Waglechner, Brian K. Coombes, Joseph B. McPhee, Sharon N. DeWitte, Hendrik N. Poinar, and Johannes Krause. A draft genome of *Yersinia pestis* from victims of the Black Death. Presented at the 81<sup>st</sup> annual meeting of the American Association for Physical Anthropologists, Portland, Oregon.
- 2011 **Bos KI**, Schuenemann VJ, Krause J, and Poinar HN. Fishing for ancient pathogens: reconstruction of the virulence-associated pPCP1 plasmid of *Y. pestis* from victims of the Black Death. Talk presented at the 39<sup>th</sup> annual meeting for the Canadian Association for Physical Anthropology, Montreal, Q.C.
- 2011 **Kirsten I. Bos**, "Fishing for ancient pathogens: *Yersinia pestis* DNA from victims of the medieval plague in London, England". Talk presented at the "Archéologie des épidémies" Workshop in Bordeaux, France.

- 2009 **Bos KI**, Forrest SA, and Poinar HN "Metagenomics and Ancient Human Disease: efficient targeted retrieval of ancient pathogen DNA for high-throughput sequencing applications". Talk presented at the 37<sup>th</sup> annual meeting for the Canadian Association for Physical Anthropology, Vancouver B.C.
- 2008 **Bos KI**, DeWitte SN, and Poinar HN. "Metagenomics and disease in past human populations". Talk presented at the 36<sup>th</sup> conference for the Canadian Association of Physical Anthropology, Hamilton, Ontario.
- 2007 Poinar HN, **Bos KI**, Sobolik K. "Metagenomics in Archaeology: the palaeofaecal record". Talk presented at the 72<sup>nd</sup> meeting for the Society of American Archaeology, Austin, Texas.
- 2002 Hoppa RD, Pletcher S and **Bos K.** "Mutation Accumulation and Reduced Mortality in Human Populations". Poster presented at the 71<sup>st</sup> Annual Meeting of the American Association of Physical Anthropologists, Buffalo, New York.

## Theses

- 2011 **Bos KI.** Genetic Investigations into the Black Death. Ph.D. thesis. McMaster University, Department of Anthropology.
- 2004 **Bos KI.** Trinitapoli: a preliminary evaluation of the human skeletal material recovered from a Middle Bronze Age burial site in southern Italy. M.A. thesis. McMaster University, Department of Anthropology.

## Guest lectures and invited talks

- 2015 "Genomic analyses of ancient pathogens" Invited talk delivered at the Ancient DNA: A Window to the Past and Future symposium in Thessaloniki, Greece.
- 2015 "Genomic analyses of historical pathogens" Invited talk delivered at the 2015 meeting for the European Society for Human Genetics in Glasgow, Scotland, United Kingdom.
- 2015 "Genomics analyses of historical pathogens". Invited talk delivered at the Institute for Evolutionary Biology, University of Zurich, Switzerland.



- 2015      *"Ancient pathogen genomics"*. Lecture delivered as part of the European course on Comparative Genomics, Ecole Normale Supérieure (ENS), Lyon, France.
- 2014      *"The great plagues of Europe and their biological legacies"*. Delivered at the University of Leuven, Belgium.
- 2014      *"Plagues of our ancestors as revealed through ancient DNA"*. Delivered at the Genetic Genealogy Conference 2014 in Dublin, Ireland.
- 2014      *"Genomic Investigations of Tuberculosis in the Precontact New World"*. Delivered at the Institute for Archaeological Sciences, University of Tuebingen, Germany.
- 2014      *"Reconstructing Ancient Pathogen Genomes from Historical Bone"*. Delivered at the 2014 Forensica conference, Prague, Czech Republic.
- 2014      *"Genetic Investigations into the Black Death"*. Public talk delivered at the Who Do You Think You Are convention, London, England.
- 2013      *"Ancient pathogen genomics: what we learn from historical diseases"*. Talk delivered at the University of Leiden, the Netherlands.
- 2013      *"A draft genome of Yersinia pestis from victims of the Black Death"*. Public talk delivered at the European Molecular Biology Laboratory (EMBL), Heidelberg, Germany.
- 2013      *"A draft genome of Yersinia pestis from victims of the Black Death"*. Public talk delivered at the Institute of Forensic Medicine, Bern, Switzerland.
- 2012      *"Human health in the past as revealed through the genomes of ancient pathogens"*. Plenary lecture delivered at the McMaster Life Sciences Interdisciplinary Research Symposium.
- 2011      *"Fishing for ancient pathogens and the genome of the Black Death"*. Talk delivered at the Hamilton Science Cafe.
- 2011      *"Genetic Investigations into the Black Death"* McMaster University undergraduate level course lecture, ANTH 2U03.

- 2010      *"Plagues in Ancient Populations"*, talk delivered for the McMaster University Medical School.
- 2009      *"Secrets of 'Secrets of the Dead'"*, McMaster University undergraduate lecture level course lecture, ANTH 2E03.
- 2009      *"The Black Death from a Molecular Perspective"*, McMaster University undergraduate level course lecture, ANTH 2U03.
- 2009      *"Medieval Mysteries meet Modern Technologies"*, McMaster University undergraduate level course lecture, ANTH 2U03.
- 2009      *"Medieval Mysteries meet Modern Technologies: the case of the Black Death"*, McMaster University Alumni Association.
- 2008      *"Ancient DNA and disease"*, McMaster University undergraduate level course lecture, ANTH 4J03.
- 2006      *"The anthropology of health and the contributions of ancient DNA data"*, McMaster University graduate level course lecture.

## **Internal Symposia presentations**

- 2007      McMaster Ancient DNA Centre laboratory seminar: *"Molecular approaches to ancient pathogens: the case of the Black Death"*
- 2006      McMaster University Anthropology departmental seminar: *"Unlocking the bowels of history: the secrets that coprolites hold with special reference to the peopling of the Americas"*

## **Courses Taught**

- 2015      Special topics in Palaeogenetics, University of Tuebingen

## **Mentoring Experience**

*Committee member for the following doctoral candidates: Åshild Vågane (University of Tuebingen), Maria Spyrou (University of Tuebingen), Michal Feldman (University of Tuebingen)*

## **Public Outreach**

- 2014        "Tales from a plague pit: what caused the Black Death?".  
Article written for the Science in School journal issued by the  
European Molecular Biology Laboratory.
- 2013        "The Mystery of Rome's X Tomb" filming for BBC documentary  
on a Roman catacomb, television programme aired July 2013.
- 2013        "Secrets in the Bones: the Hunt for the Black Death Killer"  
filming for CBC programme special edition of The Nature of  
Things, aired January 16, 2014

## **Peer Reviewer for:**

PLOS ONE

Journal of Microbiology

Molecular Biology and Evolution

Trends in Evolution and Ecology

Molecular Ecology Resources

International Journal of Osteoarchaeology

Nexus (McMaster University)

## **Service**

2009 – 2011	Hiring committee, Guelph Symphony Orchestra Artistic Director
2008 – 2011	Guelph Symphony Orchestra Board Member (player representative)
2007 – 2010	Joint Health and Safety Committee member for Science, McMaster University
2009	Hiring committee for tier 1 Canada Research Chair in skeletal biology, McMaster University
2008	Department of Anthropology Graduate Student Representative
2003	Forensic consultant, City of Hamilton Police Dept.

## **Professional organisations:**

Canadian Association of Physical Anthropology

American Association of Physical Anthropologists

Paleopathology Association

Society for American Archeology