

NATHAN M. YOUNG

University of California, San Francisco
Department of Orthopaedic Surgery
San Francisco General Hospital
Building 9, Room 346, 1001 Potrero Avenue
San Francisco, California 94110 USA

nathan.m.young@gmail.com
www.fas.harvard.edu/~palanth/Nate/Home.html
(m) +1 617-852-7431
(o) +1 415-206-5362

ACADEMIC POSITIONS

Postdoctoral Research Fellow

University of California, San Francisco, Department of Orthopaedic Surgery	2007-current
Stanford University, Department of Surgery	2006-7
University of Calgary, Department of Cell Biology & Anatomy	2004-6
Harvard University, Department of Biological Anthropology	2003-4

EDUCATION

Ph.D., A.M., Biological Anthropology, Harvard University 2003, 1998

Dissertation: *Homology and Homoplasy in the Hominoid Postcranium*
Thesis Committee: David R. Pilbeam, Daniel E. Lieberman, and Maryellen Ruvolo

B.A., Anthropology, New College of Florida 1995

Thesis: *The Significance of Pleistocene Chinese Paleoanthropological Remains to Models of Modern Human Origins*

RESEARCH INTERESTS

Developmental Basis of Phenotypic Variation: evolutionary developmental biology and the origin of variation in complex traits, evolvability and modularity, morphological integration and canalization

Human and Ape Evolution: developmental basis for human and primate craniofacial and postcranial evolution, molecular clocks and divergence times

RESEARCH GRANTS & FELLOWSHIPS

National Institutes of Health (NIH) R01, Role: Senior Personnel *priority score 24% to be resubmitted 11/2009*
Title: *"The role of continuous phenotypic variation in structural defects of the face"* (\$2.0m requested)

National Institutes of Health (NIH) Ruth L. Kirschstein National Research 2007-2009

Service Award (NRSA) Individual Postdoctoral Fellowship (F32DE018596), Role: Principal Investigator
Title: *"A Molecular Investigation of Growth and Shape Variation in Cleft-Lip Etiology"* (\$109,340)

NIH/NRSA Institutional Postdoctoral Fellowship (T32DE007306), Role: Trainee 2007

"Comprehensive Oral Health Research Training (COHORT)" (\$52,898)

Alberta Ingenuity Fund Postdoctoral Research Fellowship (#200300516), Role: PI 2004-2006

Title: *"The Structure of Forelimb and Hindlimb Covariation"* (C\$110,000)

American School for Prehistoric Research Postdoctoral Fellowship (\$34,000) 2003

Cora DuBois Charitable Trust Fellowship (\$36,000) 2002

Eliot Dissertation Completion Fellowship (\$30,000) 2001

New Mellon Fellowship: Predissertation Fieldwork (\$6,000) 1998

New Mellon Fellowship: Language Training (\$3,000) 1997

James B. Saltonstall Graduate Fellowship (\$50,000) 1996

William W. Howells Graduate Fellowship (\$50,000) 1995

ACADEMIC AWARDS

Derek Bok Center Certificate of Distinction in Teaching, Harvard University 2004, 2003, 2000

National Science Foundation Honorable Mention – Biological Anthropology 1996

National Science Foundation Honorable Mention – Physical Anthropology 1995

Hal C. Ball Award in Anthropology – New College of Florida 1993

National Merit Scholarship 1991

PUBLICATIONS available as PDFs at website; [] = # times cited via Scopus and/or ISI Web of Science (9/09)

- (20) Steiper, M.E.*, **Young, N.M.*** 2009. Primates. In: S.B. Hedges & S. Kumar (eds.), *Timetree of Life*. Oxford University Press, New York, pp. 482-486. (*contributed equally) see <http://www.timetree.org/>
- (19) **Young, N.M.**, Hallgrímsson, B., Garland Jr., T. 2009. Epigenetic Effects on Integration of Limb Lengths in a Mouse Model: Selective Breeding for High Voluntary Locomotor Activity. *Evolutionary Biology*. 36(1): 88-99.
- (18) Boughner, J.C., Wat, S., Diewert, V.M., **Young, N.M.**, Browder, L.W., Hallgrímsson, B. 2008. The *Crf4* mutation and the developmental basis for variation in facial length. *Journal of Anatomy*. 213(6), 646-662. [1]
- (17) Steiper, M.E.*, **Young, N.M.*** 2008. Timing primate evolution: lessons from the discordance between molecular and paleontological estimates. *Evolutionary Anthropology* 17, 179-188. (*contributed equally)
- (16) **Young, N.M.** 2008. A Comparison of the Ontogeny of Shape Variation in the Anthropoid Scapula: Functional and Phylogenetic Signal. *American Journal of Physical Anthropology*. 136(3), 247-264.
- (15) Hallgrímsson, B., Zelditch, M.L., Parsons, T.E., Kristensen, E., **Young, N.M.**, Boyd, S.K. 2008. Morphometrics and Biological Anthropology in the Post-Genomic Age. In: M.A. Katzenberg, S.R. Saunders (eds.), *Biological Anthropology of the Human Skeleton*. Wiley-Liss, New York, pp. 207-236.
- (14) Willmore, K.E., **Young, N.M.**, Richtsmeier, J.T. 2007. Phenotypic Variability: Its Components, Measurement, and Underlying Influential Mechanisms. *Evolutionary Biology* 34, 99-120. [6]
- (13) Hallgrímsson, B., Lieberman, D.E., **Young, N.M.**, Parsons, T., Wat, S. 2007. Evolution of Covariance in the Mammalian Skull. In: B.K. Hall & D.E. Lieberman (eds.), *Novartis Foundation Symposium - Tinkering: The Microevolution of Development, No. 284*. Wiley-Liss, New York, pp. 164-184. [7]
- (12) **Young, N.M.**, Wat, S., Diewert, V.M., Browder, L.W., Hallgrímsson, B. 2007. Comparative Morphometrics of Embryonic Facial Morphogenesis: Implications for Cleft-Lip Etiology. *Anatomical Record, Part A: Advances in Integrative Anatomy and Evolutionary Biology* 290(1), 123-139. [7]
- (11) **Young, N.M.** 2006. Function, Ontogeny and Canalization of Shape Variance in the Primate Scapula. *Journal of Anatomy* 209, 623-636. [8]
- (10) Steiper, M.E., **Young, N.M.** 2006. Primate Genomic Divergence Dates and Their Paleontological Context. *Molecular Phylogenetics & Evolution* 41, 384-394. [39]
- (9) Willmore, K.E., Zelditch, M.L., **Young, N.M.**, Ah-Seng, A., Lozanoff, S., Hallgrímsson, B. 2006. Canalization and Developmental Stability in the Brachyrrhine Mouse. *Journal of Anatomy* 208, 361-372. [14]
- (8) **Young, N.M.**, Hallgrímsson, B. 2005. Serial Homology and the Evolution of Mammalian Limb Covariation Structure. *Evolution* 59(12), 2691-2704. [32]
- (7) **Young, N.M.** 2005. Estimating Hominoid Phylogeny from Morphological Data: Character Choice, Phylogenetic Signal and Postcranial Data. In: D.E. Lieberman, R.J. Smith, J. Kelley (eds.), *Interpreting the Past: Essays on Human, Primate and Mammal Evolution in Honor of David Pilbeam*. Brill Academic Publishers, Inc., Boston, pp. 19-31.
- (6) Steiper, M.E.*, **Young, N.M.***, Sukarna, T.Y. 2004. Genomic data support the hominoid slowdown and an Early Oligocene estimate for the hominoid-cercopithecoid divergence. *Proceedings of the National Academy of Sciences USA* 101(49), 17021-17026. (*contributed equally) (Featured as an "Editor's Choice" in *Science*) [37]
- (5) Pilbeam, D.R., **Young, N.M.** 2004. Hominoid Evolution: Synthesizing Disparate Data. *Comptes Rendus Palevol*. 3(4), 303-319. [11]
- (4) **Young, N.M.** 2004. Modularity and Integration in the Hominoid Scapula. *Journal of Experimental Zoology, Part B: Molecular and Developmental Evolution* 302B, 226-240. [8]
- (3) **Young, N.M.**, MacLatchy, L. 2004. The Phylogenetic Position of *Morotopithecus*. *Journal of Human Evolution* 46, 163-184. [18]
- (2) **Young, N.M.** 2003. A Reassessment of Living Hominoid Postcranial Variability: Implications for Ape Evolution. *Journal of Human Evolution* 45, 441-464. [14]
- (1) Pilbeam, D.R., **Young, N.M.** 2001. *Sivapithecus* and hominoid evolution: some brief comments. In: L. de Bonis, G. Koufos, P. Andrews (eds.), *Hominoid Evolution and Climatic Change in Europe, Volume Two: Phylogeny of the Neogene Hominoid Primates of Eurasia*. Cambridge University Press, Cambridge, pp. 349-364. [6]

MANUSCRIPTS

- Brugmann, S.A., Powder, K., **Young, N.M.**, Goodnough, L.H., Hahn, S.M., Lovett, M., Helms, J.A. *in review*. The molecular basis for species-specific variation in facial morphology. Submitted to *Development*.
- Young, N.M.**, Wagner G.P., and Hallgrímsson B.. *in preparation*. Long Legs and Short Arms: Development and Evolvability of Hominin Limbs.
- Young, N.M.***, Chong, H.J., Hu, D., Hallgrímsson, B., Marcucio, R. *in preparation*. Sonic Hedgehog (SHH) and the Developmental Basis for Variation in Craniofacial Width. (*contributed equally).
- Young, N.M.** *in preparation*. A Developmental Model of the Evolution of the Hominoid Shoulder.
- Young, N.M.**, Fondon III, J.W. *in preparation*. The Role of Selection and Constraint in Craniofacial Variation of the Feral and Domesticated Pigeon (*Columba livia*).
- Hallgrímsson B., **Young, N.M.** *in preparation*. A Simulation Study of the Relationship of Population Variance to Measures of Phenotypic Integration.
- Young, N.M.**, and B. Hallgrímsson. *in preparation*. Development and Variation in the Evolvability of Mammalian Limbs.

PUBLISHED ABSTRACTS

- (18) **Young, N.M.**, Chong, H.J., Hu, D., Liu, W., Hallgrímsson, B., Marcucio, R. 2009. Variation in SHH-Signaling and the severity of structural defects in the face. *Society for Developmental Biology*.
- (17) **Young, N.M.**, Hu, D., Chong, H.J., Liu, W., Hallgrímsson, B., Marcucio, R. 2009. The Role of SHH variation in Structural Defects of the Craniofacial Complex. *American Association of Anatomists*.
- (16) **Young, N.M.**, Fondon III, J.W. 2009. Artificial Selection, Developmental Constraints and Craniofacial Variation in the Feral and Domesticated Pigeon (*Columba livia*). *Society for Integrative and Comparative Biology*. *Integrative and Comparative Biology*. 49(S1): e188.
- (15) **Young, N.M.**, Hallgrímsson, B., Garland Jr., T. 2008. The epigenetic effect of activity level on functional integration of the limbs. *American Journal of Physical Anthropology* S46: .
- (14) Gupta, D., **Young, N.M.**, Wan, D.C., Kwan, M.D., Slater, B.J., Brunet, L.J., Harland, R.M., Longaker, M.T. 2007. Geometric Morphometric Analysis Identifies Craniofacial Deformity in the Noggin Mutant. *International Society of Craniofacial Surgery XII Biennial International Congress*.
- (13) Gupta, D., **Young, N.M.**, Wan, D.C., Brunet, L.J., Harland, R.M., Helms, J.A., Longaker, M.T. 2007. Geometric Morphometric Analysis of Craniofacial Shape in the Noggin Mutant. *Journal of the American College of Surgeons*. 205(3):S60 (awarded "Resident Excellence in Research")
- (12) **Young, N.M.** 2007. Intraspecific Shape Variance in the Primate Scapula: The Role of Stabilizing Selection. *American Journal of Physical Anthropology*. S44:254-5.
- (11) Helms, J.A., Brugmann, S., Allen, N., **Young, N.M.** 2007. Unraveling the basis for species-specific facial form. *Integrative and Comparative Biology*. 46(S1):e58.
- (10) Hallgrímsson, B., Lieberman, D.E., **Young, N.M.**, Parsons, T.E., Wat, S., Browder, L. 2006. The Evolution of Covariation in the Mammalian Skull. Novartis Symposium.
- (9) Wat, S., **Young, N.M.**, Parsons, T.E., Browder, L.W., Diewert, V.M., Hallgrímsson, B. 2006. The *Crf4* mutation and the developmental basis for variation in facial length. *Canadian Society of Zoologists Bulletin* 37(2):129-30.
- (8) Parsons, T.E., Wat, S., Diewert, V.M., German, R.Z., **Young, N.M.**, Hallgrímsson, B. 2006. Ontogenetic development of craniofacial morphometric shape variation in A/WySnJ mouse embryos. *Canadian Society of Zoologists Bulletin* 37(2):130.
- (7) **Young, N.M.**, Hallgrímsson, B. 2006. Evolution of Mammalian Limb Covariation Structure: Implications for Primate Evolution. *American Journal of Physical Anthropology* S42:191.
- (6) **Young, N.M.**, Wat, S., Diewert, V.M., Hallgrímsson, B. 2005. The relationship of embryonic maxillary size to adult facial length. *Integrative and Comparative Biology* 45(6):1101.
- (5) Steiper, M.E., **Young, N.M.**, Sukarna, T.Y. 2005. Genomic data support the hominoid slowdown and an Early Oligocene estimate for the hominoid-cercopithecoid divergence. *American Journal of Physical Anthropology* S40:197.
- (4) **Young, N.M.**, Hallgrímsson, B. 2004. A Comparison of Patterns of Forelimb and Hindlimb Covariation in Mammals. *Integrative and Comparative Biology* 44(6):670.
- (3) **Young, N.M.** 2004. A Comparative Three-Dimensional Geometric Morphometric Study of Growth and Similarity in the Primate Scapula. *American Journal of Physical Anthropology* S38:214.

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- (2) **Young, N.M.** 2003. A Reassessment of Postcranial Variability in the Hominoids: Issues of Homology and Homoplasy. *American Journal of Physical Anthropology* S36:229.
- (1) **Young, N.M.**, MacLatchy, L. 2000. Is *Morotopithecus* a Great Ape? *American Journal of Physical Anthropology* S30:329-30.

INVITED TALKS, SYMPOSIA, WORKSHOPS

- (23) Gordon Research Conference: Craniofacial Morphogenesis & Tissue Regeneration. Invited Discussion Leader & Guest Speaker. Lucca, Italy. April 10-11, 2010.
- (22) Symposium: Morphological Variation in Development and Disease. Invited Speaker. American Association of Anatomists. New Orleans, Louisiana. April 20, 2009.
- (21) Genetics & Evolution of the Skeleton Research Initiative/Institute (GESRI), Inaugural Symposium. Invited Speaker. University of California, Berkeley. Berkeley, California. March 26, 2009.
- (20) "Variation and Developmental Biology: New Models for the Etiology of Craniofacial Dysmorphology". Invited Lecture. Department of Oral Biology, University of Illinois at Chicago. February 2, 2009.
- (19) "Making Faces: Evo-Devo and Human Cranial Variation". Invited Lecture. Department of Anthropology. Pennsylvania State University. State College, Pennsylvania. January 23, 2009.
- (18) Symposium: Patterns and processes of morphological integration in primate and human evolution. Invited Speaker. American Association of Physical Anthropology. Columbus, Ohio. April 10, 2008.
- (17) "Development and Human Evolution". Invited Lecture. Department of Anthropology, Boston University. Boston, Massachusetts. February 12, 2008.
- (16) "Cleft Lip Etiology: Molecular and Morphogenetic Mechanisms". Invited Lecture. University of California, San Francisco, School of Dentistry. San Francisco, California. January 23, 2008.
- (15) "Orangutan Enigmas and the Evolution of the Ape Postcranium". Invited Lecture. University of California, Santa Cruz, Department of Anthropology. Santa Cruz, California. May 16, 2007.
- (14) "The Evolution of the Vertebrate Face: Integrating Morphometrics and Molecules". Invited Speaker. University at Albany, Department of Biological Sciences. Albany, New York. March 7, 2007.
- (13) "A Developmental Process Perspective on the Evolution of Craniofacial Shape and Size." Invited Seminar. Stanford University, School of Medicine. Palo Alto, California. April 14, 2006.
- (10-12) "Long Legs and Short Faces: Integrating the Study of Development with Human Evolution." Invited Lect. University College London, Dept. of Anthropology, London, United Kingdom, March 23, 2006
Rutgers University, Department of Anthropology, New Brunswick, New Jersey, March 6, 2006
University at Albany, Department of Anthropology, Albany, New York, February 16, 2006
- (9) "Catarrhine Divergence Times: Estimates from Mitochondrial and Genomic Data." Invited Symposium. NYCEP: New York Regional Primatology Colloquium Series. New York, April 22, 2005.
- (8) Miocene Hominoid Postcranial Evolution Workshop. New York University. May 20-22, 2004.
- (7) "Morphological Integration: Patterns of Postcranial Covariation". Harvard University Anthropology Departmental Seminar Series. March 23, 2004.
- (6) "The Evolution of the Hominoid Postcranium: Alternative Approaches to testing Alternative Models". Invited Speaker. NYCEP. November 13, 2003.
- (5) "Reconstructing Our Ape Ancestors: The Earliest Hominoids". Invited Speaker. Harvard University Anthropology Symposium. Cambridge, Massachusetts. September 12, 2003.
- (4) "Postcranial Morphological Data: Functional or Phylogenetic Signal?". New England Biological Anthropology Symposium. Cambridge, Massachusetts. March 1, 2003.
- (3) "The Primate Scapula: Growth and Phylogeny". Division of Vertebrate Morphology of the Society for Integrative and Comparative Biology (SICB). Cambridge, Massachusetts. September 14, 2002.
- (2) "Origins and Evolution of Hominoids". Invited Paper. Les Hominidés et leurs environnements: Histoire et Interactions. Université de Poitiers, France. September 18, 2000.
- (1) "Hominoid Suspensory Adaptations: Homology or Parallelism?" Harvard University Anthropology Departmental Seminar Series. March 16, 1999.

RESEARCH COLLABORATIONS

Dr. B. Hallgrímsson (University of Calgary), Dr. G.P. Wagner (Yale University): functional/developmental modularity, variation in integration and evolvability of limbs

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Dr. M.E. Steiper (CUNY-Hunter College): primate divergence times, molecular rate evolution, discordance in phyletic and morphological divergence estimates.

Dr. J.W. Fondon III (University of Texas, Arlington): genetic and craniofacial variation in feral and domesticated pigeon breeds (*Columba livia domestica*).

TEACHING

<i>Dental Sciences 116: Oral Structure & Development</i> , UCSF, Dental School, Lecturer	2008, 2009
<i>Oral & Craniofacial Science 210: Craniofacial Development</i> , UCSF, Lecturer	2008
<i>General Human Anatomy 104</i> , University of California, Berkeley, Extension School, Instructor	2008
<i>Organismal Biology</i> , University of Calgary, Dept. Med. Sciences, Lecturer	2006
<i>Quantitative Methods in Morphometrics</i> , U. Calgary, Dept. Med. Sciences, Co-Instructor	2005
<i>Science B27: Human Evolution</i> , Harvard University, Head Teaching Fellow	2000, 2003 & 2004
<i>Anthropology 234: Hominoidea, Freshman Seminar</i> , Harvard University, Guest Lecturer	2002
<i>Anthropology 117: Human Evolution</i> , Harvard University, Teaching Fellow	1999
<i>Science B29: Human Behavioral Biology</i> , Harvard University, Teaching Fellow	1998, 1997
<i>Anthropology Laboratory, Survey of Archaeology</i> , New College of Florida, Teaching Assistant	1995, 1994

FIELDWORK EXPERIENCE

Moroto Field Project, Uganda. Dr. L. MacLachy, Boston University	2004
Bighorn Basin Expedition, Wyoming. Dr. E. Simons, Duke University	1996
Wallertheim Excavation, Germany. Dr. N. Conard, University of Connecticut	1994
Koobi Fora Field School, Kenya. Drs. H. Merrick & C. Feibel, Harvard University & National Museums of Kenya	1993
Mystery River Point Excavation, Florida. W. Burger, M.A., New College of Florida	1993

PROFESSIONAL SERVICE

Peer Review: National Science Foundation (3), *Proceedings of the National Academy of Sciences USA* (2), L.S.B. Leakey Foundation (5), *Journal of Human Evolution* (6), *Evolutionary Biology* (3), *American Naturalist* (1), *Evolution & Development* (1), *Journal of Anatomy* (3), *Paleoanthropology* (1), *Folia Primatologica* (1)

New England Biological Anthropology Symposium, Co-organizer (2003)

Consultant for the PBS television series "Evolution", WGBH Boston

Graduate Student Representative, Visiting Committee Evaluation (1999)

Floor Representative, Graduate Student Dormitory Council (1999-2000)

Graduate Student Representative, Biological Anthropology Faculty Meetings (1998-9)

PROFESSIONAL MEMBERSHIPS

American Association of Physical Anthropologists (1995-current), Society for Integrative and Comparative Biology (2004-current), Society for the Study of Evolution (2007-current), American Association of Anatomists (2008-current), Society for Developmental Biology (2009-current)

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PROFESSIONAL REFERENCES

Dr. Ralph Marcucio, Assistant Professor, Postdoctoral Supervisor
University of California, San Francisco
Department of Orthopaedic Surgery
1001 Potrero Avenue
Building 9, Room 344
San Francisco, California 94110

Phone: (415) 206-5366
Fax: (415) 647-3733
Email: marcucio@orthosurg.ucsf.edu

Dr. Benedikt Hallgrímsson, Professor, Former Postdoctoral Supervisor
University of Calgary
Department of Cell Biology & Anatomy
Health Sciences Centre
3330 Hospital Drive NW
Calgary, Alberta T2N 4N1, Canada

Phone: (403) 220-3060
Fax: (403) 210-9747
Email: bhallgri@ucalgary.ca

Dr. David R. Pilbeam, Professor, Primary Thesis Advisor
Harvard University
Department of Anthropology
11 Divinity Avenue
Cambridge, Massachusetts 02138

Phone: (617) 495-4736
Fax: (617) 496-8041
Email: pilbeam@fas.harvard.edu

Dr. Daniel E. Lieberman, Professor, Thesis Committee Member
Harvard University
Department of Anthropology
11 Divinity Avenue
Cambridge, Massachusetts 02138

Phone: (617) 495-5479
Fax: (617) 496-8041
Email: danlieb@fas.harvard.edu

Dr. Michael E. Steiper, Associate Professor, Research Collaborator
CUNY-Hunter College
Department of Anthropology
695 Park Avenue
New York, New York 10021

Phone: (212) 772-5418
Fax: (212) 772-5423
Email: msteiper@hunter.cuny.edu