

Department of Zoology
University of Cambridge
Downing Street
Cambridge, CB2 3EJ
United Kingdom

Tel. +44 (0)1223 334452
Email: jag93@cam.ac.uk
Web: <http://www.gillislab.org>
Twitter: @GillisLab

Citizenship: Canadian/British

Current Positions

Dec 2014–present Royal Society University Research Fellow
Department of Zoology, University of Cambridge, U.K

2011–present Whitman Center Scientist
Marine Biological Laboratory, Woods Hole, U.S.A.

Previous Academic Positions

Jan 2012–Nov 2014 NSERC Postdoctoral Fellow
Department of Biology, Dalhousie University

Sep 2009–Dec 2011 Royal Society Newton International Postdoctoral Fellow
Department of Physiology, Development and Neuroscience
University of Cambridge

Academic Qualifications

2009 Ph.D., Department of Organismal Biology & Anatomy, University of Chicago

2005 M.Sc. (1st, with distinction), Department of Earth Sciences, University of Bristol

2004 B.Sc. (Hons), First Class, Department of Biology, Dalhousie University

Research Grants and Fellowships

Dec 2019–Nov 2022 Royal Society University Research Fellowship Renewal (£467,469)
“Patterning and fate of vertebrate pharyngeal arches”

Jan 2019–Dec 2021 NERC Grant, NE/S000739/1 (£618,975, Co-PIs: J.J. Head and J.A. Gillis)
“Evolution of axial skeletal regionalisation in vertebrates: Integrating phylogeny, environment and developmental mechanisms”

Jan 2018–Dec 2022 Royal Society Research Grant, RGF/EA 180087 (£100,000, PI: J.A. Gillis)
“Development and evolution of gill arch appendages: the origin of paired fins”

Jun 2017–May 2020 Leverhulme Trust Research Grant, RPG-2016-373 (£170,915, PI: J.A. Gillis)
“Development of gill arch appendages: insight into the origin of paired fins”

Research Grants and Fellowships (Cont'd)

- Mar 2015–Mar 2018 Royal Society Research Grant, RG140377 (£137,661, PI: J.A. Gillis)
“Gill arch serial homology and the origin of jaws”
- Nov 2014–Nov 2017 Isaac Newton Trust Grant (£28,319, PI: J.A. Gillis)
- Nov 2014–Dec 2019 Royal Society University Research Fellowship (£559,708)
“Gill arch serial homology and origin of the jawed vertebrate body plan”
- Jan 2012–Jan 2014 Natural Sciences and Engineering Research Council of Canada Postdoctoral Fellowship (\$80,000 CAD)
- Sep 2009–Aug 2011 Royal Society Newton International Postdoctoral Fellowship (£101,000 + follow-up funds of £6,000/year for ten years)
- Sep 2009–Aug 2011 European Molecular Biology Organization (EMBO) Long Term Postdoctoral Fellowship (stipend waived)
- Jan 2006–Dec 2008 Natural Sciences and Engineering Research Council of Canada Postgraduate Fellowship (\$63,000 CAD)
- Sep 2004–Aug 2005 Commonwealth Fellowship (\$40,000 CAD)

Other Awards, Grants and Fellowships

- 2020 Anatomical Society Best Image Prize
- 2014 Marine Biological Laboratory Research Fellowship (\$11,360 USD)
- 2013 Fisheries Society of the British Isles Research Grant (£5,000)
- 2013 Marine Biological Laboratory Research Fellowship (\$9,200 USD)
- 2012 Marine Biological Laboratory Research Fellowship (\$9,700 USD)
- 2011 Marine Biological Laboratory Research Fellowship (\$10,200 USD)
- 2010 ASSEMBLE Grant, CNRS Station Bioloque, Roscoff, France
- 2010 National Geographic Society/Waitt Discovery Grant (\$7,473 USD)
- 2008 Smithsonian Link Foundation Fellowship (\$6,000 USD)
- 2008 Australian Geographic Grant, 2008 (\$2,000 AUD)
- 2008 American Museum of Natural History Lerner-Gray Grant (\$1,800 USD)
- 2008 Hinds Fund Grant, University of Chicago (\$2,000 USD)
- 2004 Sylvester-Bradley Award, Palaeontological Association (£1000)
- 2004 Dalhousie University Medal in Biology
- 2003 NSERC Undergraduate Summer Research Award (\$5,000 CAD)

Publications

- Criswell KE, Roberts LE, Koo ET, Head JJ, Gillis JA (2021) *hox* gene expression predicts tetrapod-like axial regionalization in the skate, *Leucoraja erinacea*. **Proc. Nat'l Acad. Sci. U.S.A.** 118: e2114563118.
- Hirschberger C, Sleight VA, Criswell KE, Clark SJ, Gillis JA (2021) Conserved and unique transcriptional features of pharyngeal arches in the skate (*Leucoraja erinacea*) and evolution of the jaw. **Molecular Biology and Evolution** 38: 4187-4204.
- Sleight VA, Gillis JA (2020) Embryonic origin and serial homology of gill arches and paired fins in the skate, *Leucoraja erinacea*. **eLife** 9: e60635.
- Barske L, Fabian P, Hirschberger C, Jandzik D, Square T, Xu P, Nelson N, You HV, Medeiros DM, Gillis JA, Crump JG (2020) Evolution of vertebrate gill covers via shifts in an ancient *Pou3f3* enhancer. **Proc. Nat'l Acad. Sci. U.S.A.** 117: 24876-24884.
- Marconi A, Hancock-Ronemus A, Gillis JA (2020) Adult chondrogenesis and spontaneous cartilage repair in the skate, *Leucoraja erinacea*. **eLife** 9: e53414.
- Criswell KE, Gillis JA (2020) Resegmentation is an ancestral feature of the gnathostome vertebral skeleton. **eLife** 9: e51696
- Martik ML, Gandhi S, Uy BR, Gillis JA, Green SA, Simoes-Costa M, Bronner ME. Evolution of the new head by gradual acquisition of neural crest regulatory circuits. **Nature** 574: 675-680.
- Gillis JA. (2018) The development and evolution of cartilage. In: Yelon, R. and Mayor, R. (eds) **Elsevier Reference Module in Life Sciences: Developmental Biology**.
- Gillis JA, Alsema EC, Criswell KE (2017) A trunk neural crest origin of dermal denticles in a cartilaginous fish. **Proc. Nat'l Acad. Sci. U.S.A.** 114: 13200-13205.
- Criswell KE, Coates MI, Gillis JA (2017) Embryonic origin of the gnathostome vertebral column. **Proc. Roy. Soc. B.** 284: 20172121.
- Gillis JA, Tidswell ORA (2017) The origin of vertebrate gills. **Curr. Biol.** 27: 729-732.
- Criswell KE, Coates MI, Gillis JA (2017) Embryonic development of the axial column in the little skate, *Leucoraja erinacea*. **J. Morphol.** 278: 300-320.
- Gillis JA, Hall BK (2016) A shared role for sonic hedgehog signalling in patterning chondrichthyan gill arch appendages and tetrapod limbs. **Development** 143: 1313-1317.
- Simakov O, *et al.* (incl. Gillis JA) (2015) Hemichordate genomes and deuterostome origins. **Nature** 527: 459-465.
- Gillis JA, Modrell MS, Baker CVH (2013) Developmental evidence for serial homology of the vertebrate jaw and gill arch endoskeleton. **Nat. Commun.** 4: 1436.

Publications (Cont'd)

- Baker CVH, Modrell MS, Gillis JA (2013) The evolution and development of vertebrate lateral line electroreceptors. **J. Exp. Biol.** 216: 2515-2522.
- Hall BK, Gillis JA (2013) Incremental evolution of the neural crest, neural crest cells, and neural crest-derived skeletal tissues. **J. Anat.** 222: 19-31.
- Gillis JA, Modrell MS, Northcutt RG, Catania KC, Luer C, Baker CVH (2012) Electrosensory ampullary organs are derived from lateral line placodes in cartilaginous fishes. **Development** 139: 3142-3146. [Recommended by Faculty of 1000: <http://f1000.com/717952260>]
- Gillis JA, Modrell MS, Baker, CVH (2012) A timeline of pharyngeal endoskeletal condensation and differentiation in the shark, *Scyliorhinus canicula*, and the paddlefish, *Polyodon spathula*. **J. Appl. Ichthyol.** 28: 341-345.
- Gillis JA, Fritzenwanker JH, Lowe CJ (2012) A stem-deuterostome origin of the vertebrate pharyngeal arch transcriptional network. **Proc. Roy. Soc. B.** 279:237-246.
- King BL, Gillis JA, Carlisle HR, Dahn RD (2011) A naturally occurring deletion of the entire *HoxC* cluster in elasmobranch fishes. **Science** 334:1517.
- Rawlinson KA, Gillis JA, Billings Jr. RE, Borneman EH (2011) Taxonomy and life history of the *Acropora*-eating flatworm, *Amakusaplana acroporae* nov. sp. (Polycladida: Prosthiostomidae). **Coral Reefs** 30: 693-705.
- Gillis JA, Rawlinson KA, Bell J, Lyon WS, Baker CVH, Shubin NH (2011) Holocephalan embryos provide evidence for gill arch appendage reduction and opercular evolution in cartilaginous fishes. **Proc. Nat'l Acad. Sci. U.S.A.** 108: 1507-1512.
- Gillis JA, Dahn RD, Shubin NH (2009) Shared developmental mechanisms pattern the gill arch and paired fin skeletons in vertebrates. **Proc. Nat'l Acad. Sci. U.S.A.** 106: 5720-5724.
- Gillis JA, Dahn RD, Shubin NH (2009) Chondrogenesis and homology of the visceral skeleton in the little skate, *Leucoraja erinacea* (Chondrichthyes: Batoidea). **J. Morphol.** 270: 628-643.
- Gillis JA, Shubin NH (2009) The evolution of gnathostome development: insight from chondrichthyan embryos. **Genesis** 47: 825-841.
- Gillis JA, Donoghue PCJ (2007) The homology and phylogeny of chondrichthyan tooth enameloid. **J. Morphol.** 268: 33-49.
- Gillis JA, Witten PE, Hall BK (2006) Chondroid bone and secondary cartilage contribute to apical dentary growth in juvenile Atlantic salmon. **J. Fish Biol.** 68: 1133-1143.

Selected Popular Media Coverage

- “Gnawing doubt solved.” *The Times*, 21 November 2017
- “Human teeth traced to fish scales.” *BBC News*, 20 November 2017
- “Modern research might redeem a century-old theory: Our arms and legs started as gills.” *Washington Post Online*, 21 April 2016
- “Researchers explore evolutionary link between shark gills, limbs.” *CBC News*, 21 April 2016
- “How prehistoric fish grew a pair... of human limbs”. *The Times*, 20 April 2016.
- “Human arms may have a weird evolutionary link with shark gills.” *IFL Science!* 21 April 2016
- “Human limbs may have evolved from shark gills.” *New York Post*, 19 April 2016
- “Did our arms and legs evolve from shark gills?” *Daily Mail*, 19 April 2016
- “New evidence suggests that limbs and fins evolved from fish gills.” *Gizmodo*, 19 April 2016
- “Ancestors had a sixth sense to detect aquatic electric fields.” *NBC News*, 16 August 2012
- “Ancestors of shark, humans had sixth sense.” *Discovery Channel News*, 16 August 2012
- “Skate head” and “Elephant fish embryo”, University of Cambridge “Under the microscope”
- “Mishmash Fish”. *National Geographic Magazine*, May 2011
- “Braving sharks to prove evolutionary engineering.” *USA Today*, 11 January 2011
- “*Sonic hedgehog* gene can decide elephant fish or shark.” *NBC News*, 12 January 2011
- “Nature’s way of counting digits.” *Discovery Channel News*, 10 January 2011

Professional Contributions and Service

Ad-hoc reviewer	<i>Current Biology, Development, Developmental Biology, Developmental Dynamics, eLife, EvoDevo, Evolution & Development, Journal of Anatomy, Journal of Applied Ichthyology, Journal of Fish Biology, Journal of Morphology, Journal of Structural Biology, Journal of Vertebrate Paleontology, Molecular Biology and Evolution, Nature, Palaeontology, PLoS One, Proceedings of the National Academy of Science USA, Proceedings of the Royal Society B, Seminars in Cell and Developmental Biology, Trends in Ecology and Evolution, Zoology, National Science Foundation (USA), National Institute of Health (USA), Natural Sciences and Engineering Research Council (Canada)</i>	
Societies	Anatomical Society Genetics Society British Society for Developmental Biology Society for Developmental Biology	
Service activities	2017-2021	Radiation Protection Supervisor, Dept. of Zoology, University of Cambridge
	2015-2020	Management committee, Wellcome PhD Programme in Developmental Mechanisms, University of Cambridge
	2015-2020	Chair, Cambridge Biotomography Centre
	2015-2020	Library Committee, Dept. of Zoology, University of Cambridge
	2015-2016	Co-coordinator, Wellcome PhD Programme in Developmental Mechanisms, University of Cambridge

Teaching Experience

- 2011-21 Lecturer, Embryology: Concepts and Techniques in Modern Developmental Biology, Marine Biological Laboratory, Woods Hole, U.S.A.
- 2015-21 4 lectures, "Genetics of Craniofacial Development", PDN/Zoology Part II module L6 (Development: Cell Differentiation and Organogenesis), University of Cambridge
- 2015-20 3 lectures, "Origin of jawed vertebrates", Zoology Part II module M1 (Topics in Vertebrate Evolution), University of Cambridge
- 2018-20 2 lectures, "Genetics of skeletal development", Zoology Part II module L5 (Genetics, Development and Animal Diversity), University of Cambridge
- 2015 Demonstration, "Craniofacial Development", MVST 1B (Head and Neck Anatomy), University of Cambridge
- 2012-14 2 lectures, "Neural Crest Cells and Craniofacial Development", BIOL 3050 (Developmental Biology), Dalhousie University
- 2009 Teaching Assistant, ORGB 30260 (Chordate Evolutionary Biology), University of Chicago
- 2007 Teaching Assistant, DVBI 35600 (Vertebrate Developmental Biology), University of Chicago
- 2004 Tutorial Instructor, BIOL 2060 (Genetics and Molecular Biology), Dalhousie University
- 2002 Teaching Assistant, BIOL 2060 (Genetics and Molecular Biology), Dalhousie University

Courses Taken

- 2007 Embryology: Concepts and Techniques in Modern Developmental Biology, Marine Biological Laboratory, Woods Hole, MA., U.S.A. (6 weeks + 4 weeks post-course research)

Mentorship

- Feb 2017–present Dr. Katharine Criswell, PDRA, funded by Royal Society Shooter International Fellowship (2017-2019) and NERC standard grant (2019-2021)
- Oct 2018–present Jenaid Rees, PhD student, University of Cambridge Wellcome PhD programme in Developmental Mechanisms
- Apr 2017–April 2021 Christine Hirschberger, PhD student, University of Cambridge BBSRC Doctoral Training Partnership
- Jun 2017–May 2020 Dr. Victoria Sleight, PDRA, funded by Leverhulme Trust Research Grant (*Currently: Lecturer at the University of Aberdeen*)
- Oct 2019–May 2020 Emily Hillan, Part II undergraduate research student, University of Cambridge (*Currently: MPhil student, Head lab, Dept. of Zoology, Cambridge*)
- Apr 2018–Jun 2018 Aleksandra Marconi, PhD student (rotation), University of Cambridge Wellcome PhD programme in Developmental Mechanisms (*Currently: PhD student, Santos lab, Dept. of Zoology, Cambridge*)
- Oct 2017–Mar 2018 Katie Kirk, Part II undergraduate research student, University of Cambridge (*Currently: Veterinary medicine, University of Cambridge*)
- Oct 2017–Mar 2018 Alice Bough, Part II undergraduate research student, University of Cambridge (*Currently: Working in scientific publishing*)
- Oct 2017–Mar 2018 Holly Ward, Part II BBS dissertation student, University of Cambridge (*Currently: Veterinary medicine, University of Cambridge*)

Mentorship (Cont'd)

- Apr 2016–Jun 2016 Olivia Tidswell, PhD student (rotation), University of Cambridge Wellcome PhD programme in Developmental Mechanisms
(Currently: PhD student, Akam lab, Dept. of Zoology, Cambridge)
- Oct 2015–Mar 2016 Els Alsema, Part II undergraduate research student, University of Cambridge
(Currently: MSc in Biomedicine, Karolinska Institute)
- Oct 2015–Mar 2016 Roisin Huskinson, Part II undergraduate research student, University of Cambridge
- Sep 2012–May 2013 Ariane Batic, Biology Honours Programme research student, Dalhousie University
(Currently: Marine Educator, Raincoast Education Society, British Columbia, Canada)

Invited Seminars and Conference Presentations

- “Gill arch serial homology and the origin of the jawed vertebrate body plan”. Developmental Biology Seminar Series, Princeton University. 23 April 2021
- “Gill arch serial homology and the origin of the jawed vertebrate body plan”. Evolutionary Morphology Seminar Series, University of Chicago. 14 January 2021
- “Adult chondrogenesis and spontaneous cartilage repair in the skate (*Leucoraja erinacea*)”. 79th annual meeting of the Society for Developmental Biology. 9 July 2020.
- “Dual embryonic origin of the jawed vertebrate gill arch skeleton and the evolution origin of paired fins”. Craniofacial Morphogenesis and Tissue Regeneration Gordon Research Conference, Renaissance Tuscany II Ciocco Resort, Lucca, Italy. 24 February 2020.
- “Competence, serial homology and the evolutionary origin of paired fins”. Larmor Society Lecture, St. John’s College, Cambridge. 6 November 2019.
- “Reconstructing early evolution of the vertebrate body plan”. Department of Biology, University of Florida. 1 May 2018.
- “Reconstructing early evolution of the vertebrate body plan”. Living Systems Institute, University of Exeter. 16 March 2018.
- Advancing your career as a craniofacial researcher (Mentorship career panel). Craniofacial Morphogenesis and Tissue Regeneration Gordon Research Seminar, Renaissance Tuscany II Ciocco Resort, Lucca, Italy. 11 February 2018.
- “Reconstructing early evolution of the vertebrate body plan”. Department of Zoology, University of Oxford. 9 February 2018.

Invited Seminars and Conference Presentations (Cont'd)

- "Reconstructing early evolution of the vertebrate body plan"*. Bell Center for Regenerative Biology and Tissue Engineering, Marine Biological Laboratory, Woods Hole. U.S.A. 18 January 2018.
- "Gill arch serial homology and the origin of the jawed vertebrate body plan"*. Developmental Biology Seminar Series, University of Cambridge. 20 October 2017.
- "Gill arch serial homology and the origin of the jawed vertebrate body plan"*. UK Evo-Devo Symposium, The Natural History Museum, London. 8 September 2017
- "Gill arch serial homology and the origin of the jawed vertebrate body plan"*. Department of Biology, Oxford Brookes University. 14 December 2016.
- "Gill arch serial homology and the origin of the jawed vertebrate body plan"*. School of Biological Sciences, University of Bristol. 31 October 2016.
- "A neural crest origin of trunk dermal denticles in the little skate, *Leucoraja erinacea*"*. International Congress of Vertebrate Morphology, Washington DC, U.S.A. 30 June 2016.
- "Gill arch serial homology and the origin of jawed vertebrates"*. Evolution and Development Seminar Series, University of Cambridge. 13 May 2015.
- "The development and evolution of branchial appendages in cartilaginous fishes"*. Craniofacial Morphogenesis and Tissue Regeneration Gordon Research Conference, Renaissance Tuscany II Ciocco Resort, Lucca, Italy. 1 April 2014.
- "How to build a gnathostome and where to get the parts: elasmobranch embryology and the origin of the jawed vertebrate body plan"*. Department of Organismal Biology and Anatomy, University of Chicago, Chicago, IL, U.S.A. 14 February 2014.
- "Oviparous cartilaginous fishes as emerging models of vertebrate development"*. Bell Center for Regenerative Biology and Tissue Engineering, Marine Biological Laboratory, Woods Hole, MA, U.S.A. 12 July 2013.
- "The pharyngeal endoskeleton of cartilaginous fishes: Development, serial homology and origin of the jawed vertebrate body plan"*. Developmental Biology Gordon Research Conference, Renaissance Tuscany II Ciocco Resort, Lucca, Italy. 2 July 2013.
- "Pharyngeal arch development in cartilaginous fishes, serial homology and the origin of the jawed vertebrate body plan"*. Department of Zoology, University of Cambridge, Cambridge, U.K. 13 May 2013.
- "Oviparous cartilaginous fishes as emerging models of vertebrate development"*. Department of Biology, University of Hawaii, HI, U.S.A. 3 December 2012.

Invited Seminars and Conference Presentations (Cont'd)

- "Elasmobranch embryos, transformational homology and the origin of the jawed vertebrate body plan"*. Evolution and Development Seminar Series, Duke University, Durham, NC, U.S.A. 15 November 2012.
- "Developmental evidence for the transformational homology of jaws and gill arches"*. Biology Seminar Series, Dalhousie University, Halifax, NS, Canada. 12 January 2012.
- "Oviparous chondrichthyans as emerging models of vertebrate development"*. Evolution & Development Seminar Series, University of Cambridge, U.K. 26 October 2011.
- "Oviparous chondrichthyans: emerging marine models of vertebrate development"*. Scottish Oceans Institute, University of St. Andrews, U.K. 22 September 2011.
- "The origin, evolution and development of deuterostome pharyngeal arches"*. Department of Genes, Evolution and Environment, University College London, U.K. 13 May 2011.
- "Patterning of the chondrichthyan pharyngeal arch endoskeleton"*. Interdisciplinary Approaches in Fish Skeletal Biology, Tavira, Portugal. 27 April 2011.
- "Axial patterning of the chondrichthyan pharyngeal endoskeleton: Conservation and parallel evolution of developmental mechanisms"*. CNRS Station Biologique, Roscoff, France. 16 December 2010.
- "Evolution and development of the deuterostome pharynx: insight from sharks and hemichordate worms"*. University of Cambridge, Evolution & Development Seminar Series. 14 October 2009.
- "Shared developmental mechanisms pattern the gnathostome gill arch and paired fin skeletons"*. North American Paleontological Convention. Cincinnati, Ohio, U.S.A. 22 June 2009.
- "Development and evolution of the deuterostome pharyngeal skeleton"*. MRC National Institute for Medical Research, London, U.K. 17 April 2009.