Thomas H. Boag
Department of Geosciences, Princeton University
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Education

Stanford University — Stanford, CA
Ph.D., Department of Geological Sciences — *Sept. 2015 – Sept. 2020*
Advisor: Dr. Erik Sperling

University of Toronto — Toronto, ON
M.Sc., Department of Earth Sciences — *Sept. 2014 – Aug. 2015*
Advisor: Dr. Marc Laflamme

Queen's University — Kingston, ON
B.Sc., Department of Geological Sciences and Geological Engineering — *Sept. 2009 – Apr. 2014*
Advisor: Dr. Guy Narbonne

Employment

Postdoctoral Fellow — Princeton, NJ
Department of Geosciences, Princeton University — *Jan. 2023 – present*

Donnelley Postdoctoral Environmental Fellow — New Haven, CT
Department of Earth and Planetary Sciences, Yale University — *Oct. 2020 – Dec. 2022*

Graduate Research and Teaching Assistant — Stanford, CA
Department of Geological Sciences, Stanford University — *Sept. 2015 – Sept. 2020*

Graduate Research and Teaching Assistant — Toronto, ON
Department of Earth Sciences, University of Toronto — Sept. 2014 – *Aug. 2015*

Research Assistant — Drumheller, AB
Royal Tyrrell Museum of Paleontology — *Apr. 2014 – Aug. 2014*

Undergraduate Research and Teaching Assistant — Kingston, ON
Department of Geology and Geological Engineering, Queen's University — *Sept. 2012 – Apr. 2014*

Publications

In preparation:

19. **Boag, T.H.**, Busch, J.F., Gooley, J.T., Strauss, J.V., Sperling, E.A. (2023). Deep-water occurrences of Ediacara biota prior to Shuram carbon isotope excursion in the Wernecke Mountains, Yukon, Canada.

In review:

18. Busch, J.F., **Boag, T.H.,** Sperling, E.A., Rooney, A.D., Feng, X., Moynihan, D.P., Strauss, J.V. (2023). Integrated litho-, chemo- and sequence stratigraphy of the Ediacaran Gametrail Formation across a shelf-slope transect in the Wernecke Mountains, Yukon, Canada.

17. Endress, M., **Boag, T.H.,** Sperling, E.A., Deutsch, C.A. (2023). Thermal optima in hypoxia tolerance: physiological causes and biogeographic consequences.

16. Duncan, M.I., **Boag, T.H.,** Marquez, J.A., Deres, H., Deutsch, C., Michell, F., Sperling, E.A. (2023). Marine organism responses to ocean warming are regulated by oxygen availability and body mass.

Published or in press:

2022

15. Sperling, E.A., **Boag, T.H.,** Duncan, M.I., Endriga, C.R., Marquez, J.A., Mills, D.B., Monarrez, P.M., Sclafani, J.A., Stockey, R.G., Payne, J.L. (2022). Breathless through Time; Oxygen and Animals across Earth's History. *The Biological Bulletin*. 243(2): 000-000. Doi: https://doi.org/10.1086/721754.

2021

14. Farrell, U.C., **SGP Collaborative Team**, Planavsky, N.J., Lau, K.V., Johnston, D.J., Sperling, E.A. (2021). The Sedimentary Geochemistry and Paleoenvironments Project. *Geobiology*. 00: 1-12. Doi: 10.1111/gbi.12462.

13. **Boag, T.H.**, Gearty, W., Stockey, R.G. (2021). Metabolic tradeoffs control biodiversity gradients through geological time. *Current Biology*. 31: 1-8. Doi: 10.1016/j.cub.2021.04.021.

12. Darroch, S.A.F., Cribb, A.T., Koester, B., Kenchington, C.G., Turk, K.A., Maloney, K.M., Gibson, B.M., Mocke, H., **Boag, T.H.**, O'Neil, G.R., Racicot, R.A., Smith, E.F., Schiffbauer, J.D., Buatois, L.A., Tweedt, S.M., Laflamme, M. (2020). The trace fossil record of the Nama Group, Namibia: Exploring the Ediacaran roots of the Cambrian explosion. *Earth-Science Reviews*. 212: 103435. Doi: 10.1016/j.earscirev.2020.103435.

2020

11. Rooney, A.D., Cantine, M.D., Bergmann, K.D., Gomez-Perez, I., Baloushi, B.A., **Boag, T.H.**, Busch, J.F., Sperling, E.A., Strauss, J.V. (2020). Calibrating the co-evolution of Ediacaran life and environment. *Proceedings of the National Academy of Sciences of the United States of America*. Doi: 10.1073/pnas.2002918117.

10. Maloney, K.M., **Boag, T.H.**, Facciol, A.J., Gibson, B.M., Cribb, A., Koester, B.E., Kenchington, C.G., Racicot, R.A., Darroch, S.A.F., Laflamme, M. (2020). Paleoenvironmental analysis of Ernietta-bearing Ediacaran deposits in southern Namibia. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 556. Doi: 10.1016/j.palaeo.2020.109884.

2019

9. Cribb, A., Kenchington, C., Koester, B., Gibson, B., **Boag, T.H.,** Racicot, R., Mocke, H., Laflamme, M., Darroch, S.A.F. (2019). Increase in metazoan ecosystem engineering prior to the Ediacaran-Cambrian boundary in the Nama Group, Namibia. *Royal Society Open Science*. 6(9). Doi: 10.1098/rsos.190548.

8. Muscente, A.D., Bykova, N., **Boag, T.H.,** Buatois, L.A., Mángano, M.G., Eleish, A., Prabhu, A., Meyer, M.B., Schiffbauer, J.D., Fox, P., Hazen, R.M., Knoll, A.H. (2019). Ediacaran biozones identified with network analysis provide evidence for pulsed extinctions of early complex life. *Nature Communications*. 10: 911. Doi: 10.1038/s41467-019-08837-3.

2018

7. **Boag, T.H.,** Stockey, R.G., Elder, L.E., Hull, P.M., Sperling, E.A. (2018). Oxygen, temperature, and the deep-marine stenothermal cradle of Ediacaran evolution. *Proceedings of the Royal Society B.* 285. Doi: 10.1098/rspb.2018.1724.

6. Muscente, A.D., **Boag, T.H.,** Bykova, N., Schiffbauer, J.D. (2018). Environmental disturbance, resource availability, and biologic turnover at the dawn of animal life. *Earth-Science Reviews.* 177: 248-264. Doi: 10.1016/j.earscirev.2017.11.019.

2017

5. Muscente, A.D., Schiffbauer, J.D., Broce, J., Laflamme, M., O'Donnell, K., **Boag, T.H.**, Meyer, M., Hawkins, A., Huntley, J.W., McNamara, M., MacKenzie, A., Stanley, G.D., Hinman, N.W., Hofmann, M.H., Xiao, S. (2017). Exceptionally preserved fossil assemblages through geologic time and space. *Gondwana Research*. 48: 164-188. Doi: 10.1016/j.gr.2017.04.020.

2016

4. Darroch, S.A.F., **Boag, T.H.**, Racicot, R.A., Tweedt, S., Mason, S., Erwin, D.H., Laflamme, M. (2016). A mixed Ediacaran-metazoan assemblage from the Zaris Sub-basin, Namibia. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 459: 198-208. Doi: 10.1016/j.palaeo.2016.07.003.

3. **Boag, T.H.**, Darroch, S.A.F., Laflamme, M. (2016). Ediacaran distributions in space and time: testing assemblage concepts of earliest macroscopic body fossils. *Paleobiology*. 42(4): 574-594. Doi: 10.1017/pab.2016.20.

2015

2. Darroch, S.A.F., Sperling, E.A., **Boag, T.H.**, Racicot, R.A., Mason, S.J., Morgan, A.S., Tweedt, S., Myrow, P., Johnston, D.T, Erwin, D.H., Laflamme, M. (2015). Biotic replacement and mass extinction of the Ediacara biota. *Proceedings of the Royal Society B*. 282. Doi: 10.1098/rspb.2015.1003.

1. Carbone, C., Narbonne, G.M., Macdonald, F.A., and **Boag, T.H**. (2015). New Ediacaran Fossils from the uppermost Blueflower Formation, NW Canada: Disentangling biostratigraphy and paleoecology. *Journal of Paleontology*. 89(2): 281-291. Doi: 10.1017/jpa.2014.25.

Fellowships & Awards

Gaylord Donnelley Postdoctoral Environmental Fellowship, $134,000	*2020 – 2022*
Bob Compton Fund for Field Research, $1,500	*2018*
PALASS Small Grants Scheme, $1,700	*2017*
NASA Astrobiology Institute Lewis & Clark Fund for Field Research, $5,000	*2017*
AMNH Lerner-Gray Marine Research Grant, $2,000	*2017*
Geological Society of America Graduate Student Research Grant, $1,600	*2017*
Evolving Earth Foundation Student Research Grant, $3,000	2017
NSERC Canada Graduate Scholarship, $55,000	*2016 – 2019*
McGee-Levorsen Research Grant, Stanford University, $4,000	*2016 – 2017*
Steven M. Stanley Research Award, Paleontological Society, $1,200	2015
NSERC Canada Graduate Scholarship, $17,500	*2014 – 2015*
Mary H. Beatty Fellowship, University of Toronto, $5,000	*2014*
Faculty of Arts and Science Graduate Admission Award, University of Toronto, $2,000	*2014*
Dr. William Pearson Teaching Assistant Award for Excellence, Queen's University	*2013*
NSERC Undergraduate Student Research Award, $4,500	*2013*
Queen's University Excellence Scholarship, $2,000	*2009*

Conference Presentations (primary presenter only)

2021

Boag, T.H., Stockey, R.G., Gearty, W. Metabolic tradeoffs control biodiversity gradients through geological time. GSA, Portland. (talk)

2020

Boag, T.H., Busch, J.F., Gooley, J.T., Taylor, J., Strauss, J.V., Sperling, E.A. Deep-water first occurrences of Ediacara biotas prior to the Shuram carbon isotope excursion in the Wernecke Mountains, Yukon, Canada. Geoconvention. (talk)

Boag, T.H., Elder, L.E., Marquez, A., Hull, P.M., Sperling, E.A. Bidirectional thermal limitations on invertebrate respiration drive habitat compression in response to climate change. Ocean Sciences Meeting, San Diego. (talk)

2019

Boag, T.H., Strauss, J.V., Sickmann, Z., Taylor, J.C., Busch, J., Sperling, E.A. An expanded record of Ediacaran chemostratigraphy from the Windermere Supergroup, Cariboo Mountains, British Columbia, Canada. AGU, San Francisco. (poster)

Boag, T.H., Busch, J.F., Gooley, J.T., Strauss, J.V., Sperling, E.A. Deep-water first occurrences of Ediacara biota prior to the Shuram carbon isotope excursion in the Wernecke Mountains, Yukon, Canada. GSA, Phoenix. (talk)

Boag, T.H., Stockey, R.G., Elder, L.E., Hull, P.M., Sperling, E.A. Oxygen, temperature, and the deep-marine stenothermal cradle of animal evolution. NAPC, Riverside. (talk)

Boag, T.H., Strauss, J.V., Sickmann, Z.T., Taylor, J.C., Busch, Sperling, E.A. An expanded record of Ediacaran chemostratigraphy from the Windermere Supergroup, Cariboo Mountains, British Columbia, Canada. Geobiology Bi-annual Meeting, Banff, Alberta. (poster)

2018

Boag, T.H., Stockey, R.G., Elder, L.E., Hull, P.M., Sperling, E.A. Oxygen, temperature, and the cold cradle of animal evolution. PALAAS, Bristol, UK. (talk)

Boag, T.H., Elder, L.E., Hull, P.M., Sperling, E.A. Oxygen, temperature, and the cold cradle of animal evolution: a paleophysiological perspective on the Ediacaran fossil record. SICB, San Francisco. (talk)

Boag, T.H., Elder, L.E., Hull, P.M., Somero, G.N., Sperling, E.A. Bidirectional temperature effects on aerobic scope limits the range shift capacity of marine fauna. SICB, San Francisco. (poster)

2017

Boag, T.H., Elder, L.H., Beck, C., Hull, P.M., Sperling, E.A. The synergistic role of oxygen and temperature in defining aerobic scope: physiological implications for past and future oceans. GSA, Seattle. (talk)

Boag, T.H., Elder, L.E., Reinhard, C.T., Olson, S.L., Hull, P.M., Sperling, E.A. Oxygen, temperature, and the cold cradle of animal evolution: an applied paleophysiological perspective on the Ediacaran fossil record. International Symposium on the Ediacaran-Cambrian Transition, St. John's, Newfoundland. (talk)

2016

Boag, T.H., Sperling, E.A., Strauss, J.V., Moynihan, D. Deep-water first occurrences of Ediacara-type fossils along a shelf-to-slope transect in the Wernecke Mountains, Yukon, Canada. GSA, Denver. (talk)

2015

Boag, T.H., Darroch, S.A.F., Laflamme, M. Ediacaran distributions in space and time: Testing assemblage concepts of the earliest macroscopic body-fossils. GSA, Baltimore. (talk)

Boag, T.H., Darroch, S.A.F., Laflamme, M. Biodiversity in the Precambrian fossil record: Constructing a digital database of the Ediacara biota and closing the Precambrian-Cambrian evolutionary gap. GAC-MAC, Montreal, Quebec. (talk)

Boag, T.H., Darroch, S.A.F., Laflamme, M. Revisiting the Ediacara biota in space and time. University of Toronto – Mississauga Graduate Research Colloquium, Mississauga, Ontario. (talk)
* *Awarded runner-up prize for best oral presentation*

Boag, T.H., Darroch, S.A.F., Laflamme, M. Insights into a digital database for the Ediacara biota. Advances in Earth Science Research Conference, Queen's University, Ontario. (talk)

Teaching Experience

Stanford University
Introduction to Geology *Spring 2019*
Sedimentary Geochemistry and Analysis *Spring 2018*
Introduction to Geology *Winter 2017*

University of Toronto
Geology and Public Issues *Fall 2014*
Sedimentology *Fall 2014*

Queen's University
Geological Aspects of Mineral Deposits *Winter 2014*
History of Life *Fall 2012*

Research Mentorship

Stanford University
Andy Marquez, Research Assistant *June – Aug. 2020*
Project title: *Predicting Future Viable Aerobic Habitat for the Green Sea Urchin (Strongylocentrotus droebachiensis) in the Northeastern Pacific.* Ocean Sciences Annual Conference.

Stanford University
Jason Swanepoel, Stanford SESUR Student *July – Aug. 2020*
Project title: *Organic carbon isotope geochemistry of the Early Cretaceous Rocas Verdes Basins, Patagonia*

Stanford University
Mariah Jenkins, Stanford SURGE Student *July – Aug. 2019*
Project title: *Paleoenvironmental redox proxies and mudstone geochemistry of the Early Cretaceous Rocas Verdes Basins, Patagonia*

Stanford University
Haley Deres, Undergraduate Thesis *Oct. – June 2019*
Project title: *The effects of temperature, body size, and oxygen on the Pacific Red Abalone*

Fieldwork Experience

Bamfield Marine Sciences Centre, BC, Canada: Hypoxia tolerance of the crinoid *Florometra seraettissima* *Aug. 2019*

Friday Harbor Laboratories, WA, USA: Hypoxia tolerance of the brachiopod *Terebratalia transversa* *July 2019*

Cariboo Mountains, BC, Canada: Stratigraphy and isotopic analysis of the Ediacaran to early Cambrian *Aug. 2017/2018*

Wernecke Mountains, YK, Canada: Stratigraphy and paleontology of an Ediacaran succession *July 2017/2018*

White Uplift, YK, Canada: Stratigraphy and paleontology of Cryogenian to Ediacaran strata *July 2016*

Nama Basin, Namibia: Paleontological and isotopic analysis of a late Ediacaran succession *July 2014/2015/2016*

Mackenzie Mountains, NWT, Canada: Stratigraphy and paleontology of Ediacaran strata *July 2013*

Mistaken Point and Burin Peninsula, NL, Canada: Geochemical sampling of the Ediacaran to Cambrian *June 2013*

Sutton QC, Canada: Structural geology and mapping of the Appalachian fold and thrust belt *May 2012*

Invited Talks and Seminars

6. University of Southern California, Department of Earth Sciences *2020*
5. Stanford University, Department of Geology *2020*
4. Queen's University, Department of Geological Sciences and Engineering *2019*
3. Yale University, Department of Geology and Geophysics *2017*
2. University of Toronto, Toronto High School District Science Outreach Day *2015*
1. Queen's University, Department of Biology *2015*

Service & Outreach

Professional Organization Membership:

Geological Society of America, 2015-present
Paleontology Society, 2015-present

Manuscript Reviews:

Earth and Planetary Science Letters