

# Anna C. MacPherson

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American Museum of Natural History  
New York, NY, 10024  
amacpherson@amnh.org

## EDUCATION

### Stanford University, Stanford, CA

Ph.D., Science Education, 2015

Minor, Learning, Cognition, and Assessment

Dissertation title: Developing an assessment of argumentation in the field of ecology

Committee: Dr. Jonathan Osborne, Dr. Sam Wineburg, Dr. Mark Wilson

### CUNY Hunter College, New York, NY

M.A., Adolescent Science Education, 2006

### Stanford University, Stanford, CA

B.S. with Honors, Biological Sciences, 2003

Minor, Music, 2003

Honors thesis: Glucocorticoids may play dual role in regulation of CNS inflammation

Adviser: Robert M. Sapolsky

## GRANTS and AWARDS

- National Association of Research in Science Teaching, Outstanding Doctoral Research Award, 2016  
*Dissertation judged to have the greatest significance in the field of science education from among the nominees*
- REASON International Spring School Travel Fellowship, 2015  
*Award to travel to Munich, Germany, \$700*
- Stanford Dissertation Support Grant, 2014  
*Building an assessment of students' argumentation about ecology, \$5,000*
- Anne T. and Robert M. Bass Fellowship, 2010  
*Three years of graduate tuition and stipend, \$200,000*
- Fund for Teachers Grant, Fund for Teachers, 2006  
*Exploring successful wildlife reserves in South Africa, \$5,000*
- Teaching Opportunity Program (TOP) Scholarship  
*Hunter College, City University of New York, \$9,500*
- Undergraduate Research Opportunities Small Grant, Stanford University, 2003  
*Can FK506, an anti-inflammatory drug, trigger pro-inflammatory pathways in the brain?, \$500*
- Research Grant, Howard Hughes Medical Institute, 2002  
*Glucocorticoids may play dual role in regulation of CNS inflammation, \$3,000*

## RESEARCH EXPERIENCE

### American Museum of Natural History, New York, NY

*Manager of Educational Research and Evaluation*

June 2015 - present

Leading research on two funded projects. Designing and conducting qualitative and quantitative research about the effect of a large-scale professional development program for middle school science teachers in the New York City Department of Education. Designing, validating, and analyzing the results from assessments of science learning embedded in a new, NGSS-aligned ecology curriculum. Articulating a long-term educational research agenda for the museum.

### Stanford University, Stanford, CA

*Research Assistant*

September 2010 - present

Developing items for measuring argumentation ability in grade 8 students for the Learning Progressions in Middle School Science project. Conducting cognitive labs with students. Analyzing student data using item response theory. Designing and conducting professional development for grade 8 science teachers. (PIs: Dr. Jonathan Osborne and Dr. Mark Wilson).

**Stanford University, Stanford, CA**

*Research Assistant, Stanford EdCareers*

September 2013 - September 2014

Developed, administered, and analyzed the data from the first comprehensive survey of Stanford Graduate School of Education alumni. (Supervisor: Nereyda Salinas).

**University of California, Santa Barbara, Santa Barbara, CA**

*Laboratory manager*

August 2008 - August 2010

Developed lab protocols for accurate and precise measurement of seawater chemistry. Performed molecular processing and coordinated intertidal field projects. (Supervisor: Dr. Gretchen Hofmann).

**Princeton University, Princeton, NJ**

*Field assistant*

June - August 2004

Assisted with project setup and data collection for terrestrial ecosystem ecology project in rainforests near Franz Josef Glacier, New Zealand. (Researcher: Dr. Duncan Menge).

**Stanford University, Dept. of Biological Sciences, Stanford, CA**

*Undergraduate researcher*

June 2001 - June 2003

Studied the effects of glucocorticoids on brain inflammation following seizure. (Adviser: Robert M. Sapolsky).

**TEACHING  
EXPERIENCE**

**American Museum of Natural History, New York, NY**

*Instructor*

2016-2017

Taught graduate students pursuing a Master's and teaching credential in secondary science

- Curriculum and Instruction in Earth Science, Fall 2016

**Stanford University, Stanford, CA**

*Teaching Assistant*

2012-2013

Taught graduate students pursuing a Master's and teaching credential in secondary science

- Curriculum and Instruction in Science I, Summer 2012
- Curriculum and Instruction in Science II, Fall 2012
- Curriculum and Instruction in Science III, Winter 2013

**Stanford University, Stanford, CA**

*Clinical Supervisor, Secondary Science*

2011-2013

Supervised novice teachers in their clinical teaching placement in area high schools. Met weekly with individual candidates and a small "supervisory" group. Observed teaching and provided feedback.

**Millennium High School, New York, NY**

*Teacher*

2003-2008

Taught grades 9-12 at this small, selective public high school in Manhattan

- Advisory (9<sup>th</sup> - 12<sup>th</sup> grade), 2003-2008
- \*Investigations in Biology and Chemistry II (10<sup>th</sup> grade), 2003-2008
- †Advanced Biology (11<sup>th</sup> and 12<sup>th</sup> grades), 2004-2008
- †Anatomy and Physiology (11<sup>th</sup> and 12<sup>th</sup> grades), 2006-2007
- †Research in Science (11<sup>th</sup> and 12<sup>th</sup> grades), 2007-2008
- \* Collaboratively developed curriculum
- † Designed entire curriculum

Leadership positions

- Science Department Facilitator, 2007-2008
- Cooperating Teacher, Columbia Teachers College, 2007-2008
- New Teacher Coach, 2006-2008

**OTHER  
PROFESSIONAL  
EXPERIENCE**

**Bank Street College of Education, New York, NY**

*Professional Development Specialist*

October 2014 - present

Collaborating with elementary school teachers to integrate ecology into their curricula. Leading field trips to the Tiorati Workshop in Harriman State Park.

**Empirical Education, Palo Alto, CA**

*Educational consultant*

Summer 2012

Optimized observation instrument for science teaching.

**EduChange, Inc.**, New York, NY

*Educational Consultant*

February 2009 - September 2011

Designed K-8 science curricula. Analyzed large-scale survey data.

**Ocean Acidification Training and Research Consortium**, Santa Barbara, CA

*Curriculum developer*

September 2009 - September 2010

Designed and field-tested K-12 curricula in collaboration with teachers. Coordinated and led school outreach events.

**Stanford University**, Dept. of Biological Sciences, Stanford, CA

*BioBridge Adviser*

August 2002 - June 2003

Advised undergraduate Biological Sciences majors.

**PEER-REVIEWED  
JOURNAL ARTICLES**

- Hammerness, K, **MacPherson, A**, & Gupta, P. 2016. Developing a research agenda aimed at understanding the teaching and learning of science at a natural history museum. *Curator*.
- **MacPherson, A**. 2016. A comparison of scientists' arguments and school argumentation tasks. *Science Education*. doi:10.1002/sc.21246
- Osborne, J, Henderson, JB **MacPherson, A**, Wild, A, Szu, E, & Yao, S-Y. 2016. The development and validation of a learning progression for argumentation in science. *Journal of Research in Science Teaching*, 53: 821-846. doi:10.1002/tea.21316
- Henderson, JB, **MacPherson, A**, Osborne, J, & Wild, A. 2015. Beyond construction: Five arguments for the role and value of critique in learning science. *International Journal of Science Education*, 37(10): 1668-1697.
- Henderson, JB, Osborne, J, **MacPherson, A**, & Szu, E. 2014. A New Learning Progression for Student Argumentation in Scientific Contexts. In C. P. Constantinou, N. Papadouris & A. Hadjigeorgiou (Eds.), E-Book Proceedings of the ESERA 2013 Conference: Science Education Research for Evidence-based Teaching and Coherence in Learning. European Science Education Research Association. ISBN: 978-9963-700-77-6.
- Fangué, NA, O'Donnell, MJ, Sewell, MA, Matson, PG, **MacPherson, AC**, & Hofmann, GE. 2010. A laboratory-based, experimental system for the study of ocean acidification effects on marine invertebrate larvae. *Limnology and Oceanography: Methods* 8: 441-452.
- **MacPherson, AC**, KM Dinkel, & Sapolsky, RM. 2005. Glucocorticoids worsen excitotoxin-induced expression of pro-inflammatory cytokines in hippocampal cultures. *Experimental Neurology* 194: 376-383.
- Dinkel, KM, **MacPherson, AC**, & Sapolsky, RM. 2003. Novel glucocorticoid effects on acute inflammation in the CNS. *Journal of Neurochemistry* 84: 705-716.

**MANUSCRIPTS  
UNDER REVIEW**

- Yao, S-Y, Henderson, JB, Wilson, M, Osborne, J, & **MacPherson, A**. Developing an assessment in scientific argumentation.

**MANUSCRIPTS IN  
PREPARATION**

- **MacPherson, A** & Osborne, J. Challenging the "teaching to better tests" argument: Science teachers' understanding and use of standardized test items.

**BOOKS**

- Osborne, J, Donovan, B, Henderson, JB, **MacPherson, A**, & Wild, A . 2016. *Arguing from Evidence in Middle School Science: 24 Activities for Productive Talk and Deeper Learning*, Corwin, Thousand Oaks, CA.

**BOOK CHAPTERS**

- Osborne, J, **MacPherson, A**, Patterson, A & Szu, E. 2011. Introduction. In MS Khine (2012) *Perspectives on Scientific Argumentation*, Springer.

**PEER-REVIEWED  
CONFERENCE  
PAPERS AND  
PRESENTATIONS**

- **MacPherson, A.** Measuring students' understanding of science and engineering practices, disciplinary core ideas, and crosscutting concepts through an embedded assessment system. Paper to be presented at the 2016 Annual Meeting of the National Association of Research in Science Teaching (NARST), Baltimore, MD.
- **MacPherson, A.** Measuring High School Students' Ability to Construct and Critique Arguments in Ecology. Paper presented at the 2015 Annual Meeting of the National Association of Research in Science Teaching (NARST), Chicago, IL.
- **MacPherson, A.** Developing an assessment of argumentation in ecology. Presentation to be given at the 2015 REASON Spring School, Munich, Germany, March 4-7.
- Henderson, JB, Osborne, J, **MacPherson, A** & Szu, E, Friend, M, Wild, A. IRT Analysis of Items Probing a Unidimensional Learning Progression for Argumentation of Increasingly Complex Structure. Paper presented at the 2014 Annual Meeting of the National Association of Research in Science Teaching (NARST), Pittsburgh, PA.
- Osborne, JF, Henderson, JB, **MacPherson, A** & Szu, E. Building a Learning Progression for Argumentation in Science. Fall 2013 Conference of the Society for Research on Educational Effectiveness. Washington DC, Sept 27-28.
- Osborne, J, Henderson, JB, **MacPherson, A** & Szu, E. Building a learning progression for argumentation in science education. Paper accepted to AERA, San Francisco, April 2013.
- Osborne, J, Henderson, JB, **MacPherson, A** & Szu, E. Developing assessment for a learning progression in argumentation: lessons learned. Paper accepted to NARST, Puerto Rico, April 2013.
- Osborne, J, Henderson, JB, **MacPherson, A** & Szu, E. Assessing Scientific Argumentation by Middle School Pupils and Testing a Learning Progression for Argumentation. Presentation at the annual meeting of the American Educational Research Association (AERA), Vancouver, B.C., April 2012.
- **MacPherson, AC** & Osborne, JF. There's more to science than recall: an analysis. Presentation at the National Association for Research in Science Teaching (NARST), Indianapolis, March 2012.

**WORKSHOPS FOR  
PRACTITIONERS**

- **MacPherson, AC**, Henderson, JB, Wild, A & Osborne, JF. Assessing middle school students' argumentation about the structure of matter. 2015 National Science Teachers Association Meeting, Chicago.
- **MacPherson, AC** & Osborne, JF. Improving the testing of scientific reasoning in grade 8 science. California Science Teacher's Association Meeting, Pasadena, October 2011.
- **MacPherson, AC.** Ocean Acidification: In the lab and in the classroom. Sally Ride Science Educator Institute, Los Angeles, November 2009.

**DATA ANALYSIS  
PROGRAMS**

R, ConQuest, Stata, Dedoose, NVivo, Excel