

RESEARCH INTERESTS

Application of the stable isotopes of organic matter and biominerals to questions of paleoclimate, Earth's redox evolution, paleoecology and biogeochemical cycling.

EDUCATION

- 2010** **Ph.D. Geosciences, Penn State University**
Thesis: Nitrogen biogeochemistry and ancient oceanic anoxia
- 2004** **M.S. Geosciences, Penn State University**
Thesis: Organic matter diagenesis and nitrogen isotopes in Cretaceous black shales.
- 2000** **B.S. Geology, with honors, Dickinson College, Carlisle, PA**
Thesis: The hydrothermal alteration of the Balls Bluff Siltstone, Culpepper Basin, Virginia.

ACADEMIC AND RESEARCH APPOINTMENTS

- 2012-** **Assistant Professor**, Syracuse University, Department of Earth Sciences
- 2012** **Sedimentologist**, Integrated Ocean Drilling Program, Expedition 342, Newfoundland Sediment Drifts
- 2010-2012** **Agouon Institute Geobiology Fellow**, Northwestern University, Department of Earth and Planetary Sciences
- 2003** **Sedimentologist**, Ocean Drilling Program, Leg 207, Demerara Rise
- 2000** **Instructor**, Department of Geology, Dickinson College, Carlisle, PA

FUNDED RESEARCH PROJECTS

- 2015** The National Science Foundation (\$524,435; 2015-2020)
CAREER: Nitrogen Biogeochemistry During Oceanic Anoxic Events
Role: Principal Investigator
- The National Science Foundation (\$2,965,339; 2015-2020)
NRT: Education Model Program on Water-Energy Research (EMPOWER) at Syracuse University
Role: Senior Personnel
- 2013** American Chemical Society, Petroleum Research Fund, New Doctoral Investigator Award (\$100,000; 2013-2015)
"Nitrogen isotopic composition of porphyrins from source rocks"
Role: Principal Investigator
- 2012** Consortium for Ocean Leadership (\$49,456, 2012-2015)
"Integrated Ocean Drilling Program: Cretaceous and Paleogene Nitrogen and Sulfur Cycle Dynamics: The Record from the Newfoundland Drifts" Role: Principal Investigator
- 2009** Agouon Institute Geobiology Postdoctoral Fellowship
"The co-evolution of the nitrogen and sulfur cycles in the Neoproterozoic"
(\$108,000)
- 2008** ExxonMobil Student Research Grant (\$5,000)
"The Neoproterozoic N-cycle and black shales"
- 2003** Consortium for Ocean Leadership (\$22,000)

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- “Organic matter diagenesis and nitrogen isotopes in black shales” Role:
Principal Investigator
2002 Geological Society of America Graduate Student Research Grants (\$1700)
“Paleotemperatures of high latitudes during Early Cretaceous cool periods”

PUBLICATIONS

- Junium, C. K.**, Freeman, K. H., & Arthur, M. A. (in press) Compound-specific $\delta^{15}\text{N}$ and chlorin preservation in surface sediments of the Peru Margin with implications for ancient bulk $\delta^{15}\text{N}$ records. *Geochimica et Cosmochimica Acta*
- Junium, C. K.**, Freeman, K. H., & Arthur, M. A. (2014). Controls on the stratigraphic distribution and nitrogen isotopic composition of zinc, vanadyl and free base porphyrins through Oceanic Anoxic Event 2 at Demerara Rise. *Organic Geochemistry*, 80, 60-71.
- Luo, G., **Junium, C. K.**, Kump, L. R., Huang, J., Li, C., Feng, Q., ... & Xie, S. (2014). Shallow stratification prevailed for ~ 1700 to ~ 1300 Ma ocean: Evidence from organic carbon isotopes in the North China Craton. *Earth and Planetary Science Letters*, 400, 219-232.
- Riedman, L. A., Porter, S. M., Halverson, G. P., Hurtgen, M. T., & **Junium, C. K.** (2014). Organic-walled microfossil assemblages from glacial and interglacial Neoproterozoic units of Australia and Svalbard. *Geology*, 42, 1011-1014.
- Norris, R.D., Wilson, P.A., Blum, P., and the **Shipboard Scientific Party**, (2012) Paleogene Newfoundland Sediment Drifts, Integrated Ocean Drilling Program Expedition 342 Preliminary Report, 1 June -30 July 2012, Expedition 342 Scientists.
- Kump, L., **Junium, C.**, Arthur, M., Fallick, A., Melezhik, V., Leland, A., Črne, A., Luo, G., and the FARDEEP Drilling Team, Isotopic Evidence for Massive Oxidation of Organic Matter Following the Great Oxidation Event, (2011) *Science*, 334, 1694-1695.
- Cui, Y., Kump, L.R., Ridgwell A., **Junium, C.K.**, Diefendorf, A.F., Freeman K.H, Urban, N., Charles, A., Harding, I.C., and the WUN pACE Group, (2011) Reconstruction of the rates and total quantity of carbon addition during the Paleocene-Eocene Thermal Maximum, *Nature Geoscience*, 4, 481-485.
- Junium, C.K.**, B.J., Keely, K.H., Arthur, M.A., Freeman, (2011) Chlorins in mid-Cretaceous black shales of the Demerara Rise: the oldest known occurrence, *Organic Geochemistry*, 42, 856-859.
- Polissar, P.J., Fulton, J.F., **Junium, C.K.**, Turich, C.T., Freeman, K.H., (2009) Measurement of ^{13}C and ^{15}N isotopic composition on nanomolar quantities of C and N, *Analytic Chemistry*, 81, 755-763.
- Junium, C.K.**, Mawson, D.H., Arthur, M.A., Freeman, K.H., Keely, B.J., (2008) Unexpected occurrence and significance of zinc alkyl porphyrins in Cenomanian-Turonian black shales of the Demerara Rise, *Organic Geochemistry*, 39, 1081-1087.
- Zerkle, A.L., **Junium, C.K.**, Canfield, D.E., House, C.H., (2008) Production of ^{15}N depleted biomass during cyanobacterial N_2 -fixation at high Fe concentrations, *Journal of Geophysical Research-Biogeosciences*, 113, G03014.
- Bohacs, K.M., **Junium, C.K.**, (2007) Microbial mat sedimentary structures and their relation to organic-carbon burial in the middle Neoproterozoic Chuar Group, Grand

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Canyon, Arizona, USA. In: *Atlas of microbial mat features preserved within the clastic rock record*, Schieber, J., Bose, P.K., Erickson, P.G., Banerjee, S., Sarkar, S., Altermann, W., and Catuneau, O., (Eds.) Elsevier, p. 208-213.

Junium, C.K., Arthur, M.A., (2007) Nitrogen cycling during the Cretaceous, Cenomanian-Turonian Oceanic Anoxic Event II, *Geochemistry, Geophysics, Geosystems*, 8, 3-19.

Erbacher, J., D. Mosher, M. Malone, and the **ODP Leg 207 Scientific Party**, (2004) Drilling probes past carbon cycle perturbations on the Demerara Rise, *Eos*, 85, 57-63.

Erbacher, J., Mosher, D.C., Malone, M.J., Berti, D., Bice, K.L., Bostock, H., Brumsack, H.-J., Danelian, T., Forster, A., Glatz, C., Heidersdorf, F., Henderiks, J., Janecek, T.R., **Junium, C.**, Le Callonnec, L., MacLeod, K., Meyers, P.A., Mutterlose, H.J., Nishi, H., Norris, R.D., Ogg, J.G., O'Regan, M.A., Rea, B., Sexton, P., Sturt, H., Saganuma, Y., Thurow, J.W., Wilson, P.A., Wise, S.W., Jr., (2004). Proceedings of the Ocean Drilling Program; Demerara Rise; Equatorial Cretaceous and Paleogene Paleooceanographic Transect, Western Atlantic; Covering Leg 207 of the cruises of the drilling vessel JOIDES Resolution; Bridgetown, Barbados, to Rio de Janeiro, Brazil; Sites 1257-1261; 11 January-6 March 2003, Ocean Drilling Program, College Station, TX.

COURSES TAUGHT

EAR 105, Earth Science (Fall 2012, 2013, 2014)

Large lecture course for non-majors on general geologic principles

EAR 345/545, Global Change: The Geologic Record (Spring 2012, 2013, 2014, 2015)

Upper-level undergraduate/graduate, paleoclimatology course

EAR 400/600, Earth's Organic Processes (Fall 2014)

Upper-level undergraduate/graduate seminar on organic geochemistry

EAR 405/605 Stable Isotope Geochemistry (Fall 2013)

Upper-level undergraduate/graduate, combined lecture and seminar course on principles of stable isotope geochemistry

GRADUATE ADVISEES

Kara Dennis, M.S., expected April 2015 *Using the sulfur cycle to constrain rapid changes in seawater chemistry: refining our understanding of the paleogene sulfur cycle*. (B.S. Macalaster College)

Vicky Wang, M.S., expected August 2015, *Isotope excursions and shifting oxidation states recorded in the Paleoproterozoic Franceville Basin* (B.A. Brown University)

Benjamin Uveges, Ph.D., expected 2017, *Stable nitrogen, carbon, vanadium and nickel isotopes in metalloporphyrins*. (B.S. McGill University) recipient of a Syracuse University Graduate Fellowship

GRADUATE COMMITTEES

Xiaoli Zuo (Ph.D. expected 2016, Prof. Zunli Lu advisor); David Moss (Ph.D. expected 2017, Prof. Linda Ivany advisor) and Daren McGregor (M.S. expected 2015, Prof. Linda Ivany, advisor); Mattie Friday (M.S. expected 2015, Prof.

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Christopher Scholz, advisor); Mariana Bonich (Ph.D. expected 2015, Prof. Scott Samson, advisor); Mallory Ringham (M.S. expected 2015; Prof. Gregory D. Hoke, advisor)

Xiaoli Zuo (PhD expected, Prof. Zunli Lu advisor); David Moss (PhD student) and Daren McGregor (MS expected 2015) (Prof. Linda Ivany, advisor); Mattie Friday (Prof. Christopher Scholz, advisor); Mariana Bonich (Prof. Scott Samson, advisor); Mallory Ringham (Prof. Gregory D. Hoke, advisor) - something to distinguish MS from PhD, and include a year when you can

HONORS AND AWARDS

- 2011** *Science* Perspective article written by Dr. John Hayes on Isotopic Evidence for Massive Oxidation of Organic Matter Following the Great Oxidation Event
- 2008** Department of Geosciences, PSU, Talk Award, Grad Colloquium
- 2006** Department of Geosciences, PSU, Talk Award, Grad. Colloquium
- 2005** Department of Geosciences, PSU, Talk Award, Grad. Colloquium
- 2004** Department of Geosciences, PSU, Best Talk by a Masters Student
- 2003** Ocean Drilling Program, Post-Cruise Research Grant
Post-cruise funding for investigation of the fidelity of bulk nitrogen and carbonate carbon isotope data in ancient organic-rich sediments (\$23,000 to C. Junium and M. Arthur) – is this the same one listed under ‘funding’? could leave it there and skip these two here
- 2002** Geological Society of America Student Research Grant
Funding for “Evidence of high latitude ice in the Early Cretaceous?” (\$1800) – not consistent with that listed under ‘funding’ - skip it here
- 2002** P.D. Krynine Award, Pennsylvania State University
- 2000** Vernon Prize for Excellence in Geology, Dickinson College
- 1999** Hanson Prize for Research, Dickinson College

INVITED SPEAKING ENGAGEMENTS (department seminar unless otherwise noted)

- Baylor University, Spring 2015
Life, biogeochemistry and the Neoproterozoic, Sturtian snowball Earth glaciation
- Exxon-Mobil, Upstream Research Company, Spring 2014
Biogeochemical controls on Oceanic Anoxic Event 2
- Colgate University, Spring 2014
Understanding the carbon cycle and climate through Earth's history: lessons from stable isotopes
- SUNY Oswego, Fall 2013
The rise of atmospheric oxygen on Earth: causes and consequences
- James Madison University, Fall 2013
Carbon and nitrogen cycling during the Proterozoic
- McGill University, Spring 2013
Extracting nitrogen cycle signals
- Rensselaer Polytechnic Institute, Spring 2012
Carbon and nitrogen cycling and the rise of oxygen during the Proterozoic
- University of Rochester, Spring 2012
Carbon and nitrogen cycling and the rise of oxygen during the Proterozoic
- Northwestern University, Fall 2011

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Nitrogen biogeochemistry and ancient oceanic anoxia: lessons from the Turonian and Neoproterozoic
University of Pittsburgh, Spring 2011
Nitrogen biogeochemistry and ancient oceanic anoxia
Binghamton University, Spring 2011
Nitrogen biogeochemistry and ancient oceanic anoxia
Syracuse University, Spring 2011
Nitrogen biogeochemistry and ancient oceanic anoxia
Exxon Mobil, Upstream Research Company, Spring 2007
Organic matter production and preservation in the Precambrian
Dickinson College, Spring 2005
Oceanic Anoxic Events

PROFESSIONAL SERVICE

Invited participant at 'Exploring the Cretaceous Greenhouse through Scientific Ocean Drilling' Workshop in London, April 2013, funded by NSF
Invited Participant in United States IODP planning meeting for 2013-2023 funding round, Denver, CO, April 2012.
Invited Participant at *INVEST (IODP New Ventures in Exploring Scientific Targets)* in the fall of 2009 in Bremen, Germany. This program was designed to solicit the IODP participant community to assist in the development of the new science plan for future IODP program
Sessions Chaired at Professional Meetings
American Geophysical Union, Fall 2014. – *Carbon isotopes and stratigraphy: extracting the signal from the noise*, with Joao Trabucho-Alexandre (Utrecht) and Peter Swart (University of Miami)
Reviewer for: *Paleoceanography; Organic Geochemistry; Palaeogeography, Palaeoclimatology, Palaeoecology; Techniques in Enzymology; Geochimica et Cosmochimica Acta; Geochemistry, Geophysics, Geosystems; Earth and Planetary Science Letters; Nature.*
Proposal reviewer for National Science Foundation programs: Low-Temperature Geochemistry and Geobiology; Sedimentary Geology and Paleobiology; and Marine Geology and Geophysics

PUBLIC OUTREACH

Judge for the Central New York Science Fair, March 24, 2013.
Keynote Speaker, Central New York Science Fair, *Earth's Climate History* (audience of roughly 500 K-12 students, parents, and teachers) March 24, 2013

ASSOCIATION MEMBERSHIPS

American Geophysical Union
Geological Society of America

UNIVERSITY, COLLEGE AND DEPARTMENT SERVICE

Lower Division Advisor for incoming students to the College of Arts and Science, Syracuse University (2012, 2013)

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Coordinator for the K. Douglas Nelson Lecture Series, Department of Earth Sciences
(2012-2014)

CONFERENCE PRESENTATIONS (*student author under my direct supervision)

- Junium**, C.K., Reidman, L.A., Hurtgen, M.T., Halverson, G.P., Porter, S. The nitrogen cycle in the aftermath of the mid-Cryogenian snowball Earth glaciation. American Geophysical Union, Fall Meeting, 2014. (invited).
- Junium**, C.K., Meyers, S.R., Arthur, M.A. Why so low? Making sense of ^{15}N -depleted nitrogen isotope values in the Late Cretaceous. American Geophysical Union, Fall Meeting, 2014. (invited).
- Dennis*, K.E., **Junium**, C.K., Interrogating the Paleogene sulfur cycle, carbonate-associated sulfate and pore water sulfate $\delta^{34}\text{S}$ from Demerara Rise and Newfoundland Drifts. American Geophysical Union, Fall Meeting, 2014.
- Uveges*, B.T., **Junium**, C.K., Cohen, P.A., Boyer, D., Environmental conditions during the Frasnian-Famennian mass extinction inferred from chlorophyll-derived porphyrin biomarkers American Geophysical Union, Fall Meeting, 2014.
- Wang*, V.W., **Junium**, C.K., Lu, Z., Preat, A., Isotope excursions and shifting oxidation states recorded in the Paleoproterozoic Franceville Basin American Geophysical Union, Fall Meeting, 2014.
- Junium**, C.K., Meyers, S.R., Arthur, M.A. Nitrogen Cycle Response to Climate Dynamics during the Late Cretaceous: Ice in a Greenhouse World? Goldschmidt Conference, Sacramento, CA, 2014.
- Junium**, C.K., The Biogeochemistry of Black Shales Following the Neoproterozoic, Mid-Cryogenian (Sturtian) Snowball Earth Event of Australia. American Association of Petroleum Geologists, Annual Convention & Exhibition, Houston, TX, 2014.
- Junium**, C.K., Factors Controlling the Preservation of Porphyrins and Formation of Metalloporphyrins with Perspectives From Ancient Source Rocks and Modern Analogs. American Association of Petroleum Geologists, Annual Convention & Exhibition, Houston, TX, 2014.
- Junium**, C.K., Bornemann, A., Bown, P., Friedrichs, O., Moriyama, K., Kirtand-Turner, S. Whiteside, J., Expedition 342 Scientists, A New Oceanic Anoxic Event 2 record from the Central North Atlantic IODP Expedition 342: Temporal transience of black shale deposition, Newfoundland Drifts. American Geophysical Union, Ocean Sciences Meeting, 2014.
- Junium**, C.K., Bornemann, A., Bown, P., Friedrichs, O., Moriyama, K., Kirtand-Turner, S. Whiteside, J., Expedition 342 Scientists, A New Oceanic Anoxic Event 2 record from the Central North Atlantic at South East Newfoundland Ridge, IODP Expedition 342, Newfoundland Drifts. American Geophysical Union, Fall Meeting, 2013.
- Junium**, C.K., Reidman, L.A., Hurtgen, M.T., Halverson, G.P., Porter, S., Nutrient cycling pursuant to the Sturtian Snowball Earth: evidence for a bioinorganic bridge, Geological Society of America Meeting, Fall 2012.
- Junium**, C.K., Hurtgen, M.T., Halverson, G.P., Constraining the Early Neoproterozoic Nitrogen Cycle, Geological Society of America Meeting, Fall 2012 (invited)
- Junium**, C.K. Kump, L., Michael Arthur, Anthony Fallick, Victor Melezhik, Aivo Lepland, Alenka Črne, Genming Luo. Nitrogen cycling following The Great

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- Oxidation Event, evidence from the Paleoproterozoic of Fennoscandia. American Geophysical Union, Fall Meeting, 2011 (*invited*).
- Cui, Y., Kump, L.R., Ridgwell, A., **Junium**, C.K., Diefendorf, A.F., Freeman, K.H., Urban, N. 2010 Carbon addition during the Paleocene-Eocene Thermal Maximum: Model inversion of a new, high-resolution carbon isotope record from Svalbard. American Geophysical Union. San Francisco, USA.
- Junium**, C.K., Meyers, S., Arthur, M.A., An eccentric Cretaceous nitrogen cycle? Geological Society of America Meeting, Denver 2010.
- Cui, Y., Kump, L.R., Ridgwell, A., Diefendorf, A.F., **Junium**, C.K. 2010. A high-resolution record from Svalbard of carbon release during the Paleocene-Eocene Thermal Maximum. Extended abstract. *Journal of Earth Science*, 21: 190-193.
- Kump, L., Christopher **Junium**, Michael Arthur, Anthony Fallick, Victor Melezhik, Aivo Lepland, Alenka Črne, Genming Luo; Carbon and Nitrogen Cycling Pursuant to the Great Oxidation Event: Evidence from the Paleoproterozoic of Fennoscandia, 2nd International Geobiology Conference, Wuhan, China, 2010.
- Junium**, C.K., Arthur, M.A., Keely, B.J., Freeman, K.H., Intermolecular nitrogen isotopic variability in metalloporphyrins, International Meeting on Organic Geochemistry, Bremen, Germany, 2009.
- Junium**, C.K., Arthur, M.A., Freeman, K.H., Pre-Snowball Earth ecosystems, insights from nitrogen isotopes in the Neoproterozoic Kwagunt Formation of the Chuar Supergroup, Grand Canyon. American Geophysical Union, Fall Meeting, San Francisco, 2008.
- Junium**, C.K., Arthur, M.A., Keely, B.J., Freeman, K.H., Compound specific nitrogen isotopes utilizing multiple geoporphyrins during Cretaceous Oceanic Anoxic Events, understanding the impact of redox changes on the nitrogen cycle, NASA Astrobiology Science Conference, Santa Clara, 2008.
- Junium**, C.K., The evolution of an Oceanic Anoxic Event, 2007, ExxonMobil Upstream Research Company, Mudrock Symposium (*invited*).
- Junium**, C.K., Arthur, M.A., Keely, B.J., Freeman, K.H., A compound specific nitrogen isotope record utilizing multiple geoporphyrins and chlorins through the Cenomanian-Turonian Oceanic Anoxic Event II at Demerara Rise, American Geophysical Union, Fall Meeting, San Francisco, 2007.
- Junium**, C.K., Zerkle, A.L., Arthur, M.A., The Fix is On! High surface water Fe conditions indicated by extremely low nitrogen isotope values in black shales, American Geophysical Union, Fall Meeting, San Francisco, 2006.
- Junium**, C.K., Arthur, M.A., Nutrient Dynamics during the Cenomanian-Turonian Oceanic Anoxic Event II in the North Atlantic Region, Geological Society of America Meeting, Philadelphia 2006.

FIELD AND RESEARCH EXPERIENCE

Buffalo Area, New York, Field collection and stratigraphy of the Frasnian-Fammenian Boundary (Summer 2014)

Field work with Drs. Diana Boyer (SUNY Oswego) and Phoebe Cohen (Williams College) on the effects of euxinia on primary producer communities.

Newfoundland Drifts, Sedimentologist, IODP Expedition 342, (Summer 2012)

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- Duties included supervision of sedimentology staff (AM shift), initial description and interpretation of recovered sediments, and preparation of initial results for the larger scientific community.
- Tasmania, Field Season, (December, 2010)
Field collection and stratigraphy of Neoproterozoic sediments pursuant to Snowball Earth and the rise of oxygen in the Ediacaran.
- Northern Territories and Southern Australia (Summer 2010)
Collection of Neoproterozoic black shales from core repositories pursuant to Snowball Earth and the rise of oxygen in the Ediacaran.
- Svalbard, Norway, Worldwide University Network, Paleogene Arctic Climate Expedition (Summer 2008)
Field and core collection of Paleogene shales with an emphasis on the Paleocene-Eocene Thermal Maximum.
- Fayetteville Green Lake, Syracuse, NY (several trips from 2005-2008)
Field-based water column chemistry and sediment core retrieval for pigment and isotopic analyses
- University of York, Worldwide University Network summer exchange to, UK, Organic geochemistry of chlorophyll derivatives (Summer 2005)
I joined the lab of Professor Brendan Keely to learn techniques for the extraction and identification of photosynthetic pigments from sedimentary materials
- ExxonMobil Research Lab, Intern (Summer 2004)
In this project I focused on the range of processes that fostered the formation of black shales in Neoproterozoic sediments of the Grand Canyon. I integrated wide range of sedimentological and geochemical data (organic, inorganic and stable isotope data) as well as results from simple climate models. *Kevin Bohacs and Lori Summa supervisors
- Demerara Rise, Sedimentologist, Ocean Drilling Program Leg 207 (Winter, 2003)
Duties included initial description and interpretation of recovered sediments and preparation of initial results for the larger scientific community.
- Svalbard, Norway (Summer 2002)
Field collection of mid-Cretaceous sediments
- Culpeper Basin, Leesburg, Virginia (1998-1999)
Detailed measurement of sections and collection of samples for geochemical analysis.
- Absaroka Mountains, Wyoming (Summer 1997)
Assisted in the surveying of a rock glacier