

# CHRISTOPHER K. JUNIUM

CURRICULUM VITAE

ASSOCIATE PROFESSOR OF EARTH SCIENCES • SYRACUSE UNIVERSITY  
DEPARTMENT OF EARTH SCIENCES • SYRACUSE, NEW YORK, 13244

## RESEARCH INTERESTS

- Application of the stable isotopes of organic matter, specific compounds and biominerals to questions of paleoclimate, Earth's redox evolution, paleoecology and biogeochemical cycling.
- Geologic, climatic and biogeochemical conditions that contribute to the deposition of black shales.
- Development of novel analytical tools for the analysis of the carbon and nitrogen stable isotopic composition of organic materials.

## 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

- 2019-**      **Associate Professor**, Syracuse University, Department of Earth Sciences
- 2019**      **Visiting Researcher**, University of St Andrews, Scotland (Summer)
- 2012-2019**      **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

- 2019**      The National Science Foundation (\$59,212 to SU; 2019-2021)  
*Collaborative Research: Tiny fossils, big questions: Using organic carbon isotopes of single fossils to illuminate Proterozoic eukaryotic ecosystems*
- 2016**      The National Science Foundation (\$312,182; 2016-2018)  
*Seasonality, Summer Cooling, and Calibrating the Approach of the Icehouse in Late Eocene Antarctica*  
Role: Co-Principal Investigator
- 2015**      The National Science Foundation (\$524,435; 2015-2021)  
*CAREER: Nitrogen Biogeochemistry During Oceanic Anoxic Events*  
Role: Principal Investigator

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- The National Science Foundation (\$2,965,339; 2015-2020)  
*NRT: Education Model Program on Water-Energy Research (EMPOWER) at Syracuse University*  
Role: Senior Personnel
- 2014** The National Science Foundation of China (\$160,000; 2014-2019)  
*Nitrogen Cycle Dynamics During the Mesoproterozoic: Testing the Bio-inorganic Bridge*  
Role: Co-Principal Investigator with Genming Luo
- 2013** American Chemical Society, Petroleum Research Fund, New Doctoral Investigator Award (\$100,000; 2013-2017)  
*"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** Agouron 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)  
*"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

\*graduate student author, +visiting researcher

- \*Uveges, B.T., **Junium, C.K.**, Scholz, C.A. and Fulton, J.M., 2020. Chemocline collapse in Lake Kivu as an analogue for nitrogen cycling during Oceanic Anoxic Events. *Earth and Planetary Science Letters*, 548, p.116459.
- He, R., Lu, W., **Junium, C.K.**, Ver Straeten, C.A. and Lu, Z., 2020. Paleo-redox context of the Mid-Devonian Appalachian Basin and its relevance to biocrises. *Geochimica et Cosmochimica Acta*, 287, 328-340.
- \*Das, S., Judd, E.J., Uveges, B.T., Ivany, L.C. and Junium, C.K., 2020. Variation in  $\delta^{15}\text{N}$  from shell-associated organic matter in bivalves: Implications for studies of modern and fossil ecosystems. *Palaeogeography, Palaeoclimatology, Palaeoecology*, p.110076.
- Lloyd, M.K., McClelland, H.L.O., Antler, G., Bradley, A.S., Halevy, I., **Junium, C.K.**, Wankel, S.D. and Zerkle, A.L., 2020. The isotopic imprint of life on an evolving planet. *Space Science Reviews*, 216, 7, 1-54.
- +Mettam C., Zerkle, A. Claire, M., Prave, A., Poulton, S., **Junium, C.K.**, (2019) Anaerobic nitrogen cycling on a Neoproterozoic ocean margin, *Earth and Planetary Sciences*, 527, 115800.

- <sup>+</sup>Yang, J., **Junium, C.K.**, Grassineau, N.V., Nisbet, E.G., Izon, G., Mettam, C., Martin, T., and Zerkle A.L., (2019) A ferruginous ammonium-rich ocean at ~2.7 Ga, *Nature Geoscience*, 12, 553.
- Judd, E.J., Ivany, L.C., DeConto, R.M., Halberstadt, A.R.W., Miklus, N.M., **Junium, C.K.** and Uveges, B.T., (2019) Seasonally resolved proxy data from the Antarctic Peninsula support a heterogeneous middle Eocene Southern Ocean. *Paleoceanography and Paleoclimatology*, 34(5), pp.787-799.
- Demott, L.M., Scholz, C.A., Teece, M. and **Junium, C.K.**, (2019) Microbially-influenced lacustrine carbonates: a comparison of Late Quaternary Lahontan tufa and modern thrombolite from Fayetteville Green Lake, NY, *Geobiology*, in press.
- Demott, L.M., Scholz, C.A. and **Junium, C.K.**, (2019) 8200-year growth history of a Lahontan-age lacustrine tufa deposit. *Sedimentology*.
- Uveges, B.T.\*, Teece, M., Fulton, J.M., **Junium, C.K.**, (2018) Environmental controls on pigment distributions in the freshwater microbialites of Fayetteville Green Lake, *Organic Geochemistry*, 125, pp. 65-76
- Junium, C.K.**, Dickson, A.J., Uveges, B.T.\*, (2018). Perturbation to the nitrogen cycle during rapid Early Eocene global warming. *Nature Communications*, 9, pp. 3186.
- Uveges, B.T.\*, **Junium, C.K.**, Boyer, D., Cohen, P., Day, J., Biogeochemical controls on black shale deposition during the Devonian, Frasnian-Famennian Biotic Crisis in the Illinois and Appalachian Basins, USA, inferred from stable isotopes of Nitrogen and Carbon. *Paleogeography, Paleoclimatology, Paleoecology*, 10.1016/j.palaeo.2018.05.031.
- Pehr, K. Love, G.D., Kuznetsov, A., Podkovyrov, V., **Junium, C.K.**, Shumlyanskyy, L., Sokur, T., and Bekker, A., 2018. Ediacaran fauna flourished in oligotrophic and bacterially dominated marine environments across Baltica. *Nature Communications*, 9, pp. 1807.
- Luo, G.<sup>+</sup>, **Junium, C.K.**, Izon, G., Ono, S., Beukes, N.J., Algeo, T.J., Cui, Y., Xie, S. and Summons, R.E., 2018. Nitrogen fixation sustained productivity in the wake of the Palaeoproterozoic Great Oxygenation Event. *Nature Communications*, 9, pp. 978-987.
- Junium, C.K.**, Meyers, S.R. and Arthur, M.A., 2018. Nitrogen cycle dynamics in the Late Cretaceous Greenhouse. *Earth and Planetary Science Letters*, 481, pp.404-411.
- Mettam, C.<sup>+</sup>, Zerkle, A.L., Claire, M.W., Izon, G., **Junium, C.K.** and Twitchett, R.J., 2017. High-frequency fluctuations in redox conditions during the latest Permian mass extinction. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 485, pp. 210-223.
- Zerkle, A.L., Poulton, S.W., Newton, R.J., Mettam, C., Claire, M.W., Bekker, A. **Junium, C.K.**, 2017. Onset of the aerobic nitrogen cycle during the Great Oxidation Event. *Nature*, 542, pp. 465-467.
- Zhou, X., Jenkyns, H.C., Owens, J.D., **Junium, C.K.**, Zheng, X.Y., Sageman, B.B., Hardisty, D.S., Lyons, T.W., Ridgwell, A. and Lu, Z. (2015) Upper ocean oxygenation dynamics from I/Ca ratios during the Cenomanian-Turonian OAE 2, *Paleoceanography*, 30, pp. 510-526.
- Junium, C. K.**, Freeman, K. H., & Arthur, M. A. (2015) 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*, 160, pp. 306-318.
- 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., and 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.K.**, Arthur, M., Fallick, A., Melezhik, V., Lepland, 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 <sup>13</sup>C and <sup>15</sup>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 <sup>15</sup>N depleted biomass during cyanobacterial N<sub>2</sub>-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 Canyon, Arizona, USA. In: *Atlas of microbial mat features preserved within the clastic rock record*, Schieber, J., Bose, P.K., Ericksson, 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., Suganuma, 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;

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Bridgetown, Barbados, to Rio de Janeiro, Brazil; Sites 1257-1261; 11 January-6 March 2003, Ocean Drilling Program, College Station, TX.

### COURSES TAUGHT

CAS 100, First Year Forum (Fall 2018)

EAR 105, Earth Science (Fall 2012, 2013, 2014, 2016, 2017, 2018, 2019)

Large lecture course for non-majors on general geologic principles (~300 students)

EAR 345/545, Global Change: The Geologic Record (Spring 2012, 2013, 2014, 2015, 2017, 2018)

Upper-level undergraduate/graduate, paleoclimatology course (10 students)

EAR 400/600, Earth's Organic Processes (Fall 2014, 2017)

Upper-level undergraduate/graduate seminar on organic geochemistry

EAR 405/605 Stable Isotope Geochemistry (Fall 2013, 2016)

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

EAR 600 The EMPOWER Field Course (Summer 2017, 2018, 2019)

Graduate student field course focused on Fayetteville Green Lake (2017; 2019) and Lake Kivu, Rwanda (2018)

### GRADUATE ADVISEES

**Kara Dennis, M.S.**, February 2015 *Using the sulfur cycle to constrain rapid changes in seawater chemistry: refining our understanding of the paleogene sulfur cycle.* (B.S. Macalaster College)-currently a hydrologist with the Minnesota Department of Health

**Benjamin Uveges, Ph.D.**, September 2018, *Nitrogen cycle perspectives on stratified marine systems in the geologic record.* (B.S. McGill University), recipient of a Syracuse University Graduate Fellowship-currently Visiting Assistant Professor of Earth Sciences at Syracuse University

**Shibajyoti Das, Ph.D.**, expected 2021, Paleocology and trophic structure during Oceanic Anoxic Events (M.S. University of Kolkata)

**Alaina Hickey, M.S.**, expected Spring 2021, Nitrogen biogeochemistry of the meromictic Glacier Lake, Jamesville NY (B.S. Syracuse University)

### HONORS AND AWARDS

**2019** University of St Andrews Global Fellowship, St Andrews, Scotland

**2015** NSF CAREER Award

**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

**2002** Geological Society of America Student Research Grant

**2002** P.D. Krynine Award, Pennsylvania State University

**2000** Vernon Prize for Excellence in Geology, Dickinson College

**1999** Hanson Prize for Research, Dickinson College

### PROFESSIONAL SERVICE

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### Sessions Chaired at Professional Meetings

American Geophysical Union, Fall Meeting, 2016. - "Nutrient cycling in past oceans", AGU Fall Meeting, San Francisco, USA with Tony Wang, Abby Ren and Masha Prokopenko.

Geological Society of America, Fall Meeting 2016. – “*Sedimentary, Paleobiologic, and Geochemical Studies of Deep Time Ocean-Climate Perturbations: Honoring the Scientific Contributions of Michael A. Arthur*”, with Bradley Sageman and Matthew Hurtgen.

American Geophysical Union, Fall Meeting, 2014. – “*Carbon isotopes and stratigraphy: extracting the signal from the noise*”, with Joao Trabucho-Alexandre and Peter Swart.

**Reviewer for:** *Paleoceanography and Paleoclimatology; Organic Geochemistry; Palaeogeography, Palaeoclimatology, Palaeoecology; Techniques in Enzymology; Geochimica et Cosmochimica Acta; Geochemistry, Geophysics, Geosystems; Earth and Planetary Science Letters; Nature, Nature Geoscience, Geology, Geobiology, PNAS, Science Advances, Astrobiology.*

**Proposal reviewer and panelist\* for:** National Science Foundation programs: Low-Temperature Geochemistry and Geobiology; Sedimentary Geology and Paleobiology\*; Marine Geology and Geophysics; NASA\*

**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

### UNIVERSITY, COLLEGE AND DEPARTMENT SERVICE

Future Professoriate Program, Earth Sciences Department Liaison

Graduate Admissions Committee (2019-present)

Curriculum Committee, Department of Earth Sciences (2017-2018)

Climate Science Faculty Search Committee, Department of Earth Sciences

Department Chair Search Committee, Department of Earth Sciences

Member of the College of Arts and Sciences Faculty Council

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

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