

Christopher Lynn Coughenour

Geoscientist

CONTACT INFORMATION

Work

The University of Toledo
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EDUCATION

Drexel University, Philadelphia, Pennsylvania

- Ph.D., Geoscience, September, 2009
- Department of Environmental Science
- Dissertation Title: “An Analysis of Cyclic Tidal Deposits: Statistical Time Series Properties, Extraction of Earth-Moon Parameters, and Observed Intertidal Sedimentation”
- Primary Advisor: Dr. Kenneth J. Lacovara

Drexel University, Philadelphia, Pennsylvania

- B.S., Physics, June, 2004
- Department of Physics

RESEARCH INTERESTS

As a geoscientist, I am interested in solving problems that require a quantitative and interdisciplinary approach. Much of my prior work has focused on exploring the stratigraphy and sediment transport in strongly tidal marginal marine systems. This work was performed on intertidal flats, primarily in Cook Inlet, Alaska. Sediments deposited during monitored tidal cycles were cored and logged at mm-scale, then grain-size trends were analyzed and fine sedimentary structures interpreted to probe the dynamics of transport and links to facies.

Cyclostratigraphy and the evolution of the Earth-Moon system are related facets of tidal geology. For cyclic tidal rhythmites, I have specialized in statistical and spectral analysis techniques used to find the cyclicities present in some tidal deposits and to quantify the uncertainty in such measurements. With periodic content from the depositional record, one can find the lunar orbital distance and Earth's rotation rate. This may help in finding more answers to the long-standing problem of calculating tidal dissipation rates in Earth's history.

TEACHING INTERESTS

Much of my teaching material and curricular planning has been built on the theme of teaching geoscience in interdisciplinary programs with an emphasis on the application of quantitative skills and fundamental knowledge from other sciences. To date, I have taught a range of topics including sediment transport, geomorphology, weathering, aspects of geochemistry and environmental science, stratigraphy, and the equivalents of physical geology and historical geology (with labs). I have taught traditional courses and full-time, team-taught programs, and have taught with a chemist (for two programs), a biologist, a biogeographer, and a biogeochemist.

PUBLICATIONS

Journals

Coughenour, C.L., Archer, A.W. and Lacovara, K.J. 2009. Tides, tidalites, and secular changes in the Earth-Moon system. *Earth-Science Reviews*. v. 97, 59-79.

Coughenour, C.L. and Lacovara, K.J. Spatial and temporal analysis of the fluvio-estuarine transition and rhythmic sedimentation in Turnagain Arm, Alaska. *Marine Geology*. (In revision).

Coughenour, C.L., Archer, A.W. and Lacovara, K.J. Calculation of past Earth-Moon parameters from sub-yearly tidal deposition records. *Journal of Sedimentary Research*. (In review).

Coughenour, C.L. The log-normal distribution in geoscience teaching. (In preparation for submission to *Journal of Geoscience Education*).

Abstracts/Presentations

Bopegedera, D. and Coughenour, C.L. Investigating Geologically Important Samples in the General Chemistry Laboratory: Analysis of alkaline lake waters for the quantitative determination of alkalinity, dissolved solids, calcium and magnesium ion contents. Biennial Conference on Chemical Education. Penn State University, State College, PA. July, 2012.

Coughenour, C.L. and Bopegedera, D. Earth Matters: Successes and Challenges in Teaching an Integrated Chemistry-Geology Course. Washington College Chemistry Teachers Association, Annual Meeting, Leavenworth, WA. October, 2010.

Coughenour, C.L. and Lacovara, K.J. Analysis and Implications of High Resolution Tidal Deposits from Cook Inlet, Alaska. Seventh International Conference on Tidal Environments. Qingdao, China. October, 2008.

Coughenour, C.L. Tidal Rhythmites and Their Implications in Surmising Earth Moon Dynamics. SEPM Student Awards Poster Session: 2007 AAPG Annual Convention and Exhibition. Technical Program. March, 2007.

Coughenour, C.L. and Lacovara, K.J. Absolute Time-Reckoning using Tidal Rhythmites: An Improved Method for Studying the History of the Earth-Moon System. *Geological Society of America Abstracts with Programs*, Vol. 37, No. 7, p. 508. October, 2005.

Curriculum

Coughenour, C.L. 2011. Changing rates of change. Science Education Resource Center (SERC) at Carleton College. Developed for publication via the Washington Center, Curriculum for the Bioregion Initiative.

TEACHING

The University of Toledo, Toledo, OH
Visiting Assistant Professor

Aug. 2012 – present

- Teaching “Surficial Processes” course for upper-division students. Emphasis placed on coverage of weathering, sediment transport, map reading, aerial photo interpretation, and recognition of landforms in the field and on maps. Also teaching “Physical Geology.”

Physics, Summer, 2011-12

- Eight credit algebra-based physics program covering topics equivalent to two quarters of instruction. Kinematics, dynamics, work, energy, electricity, and magnetism were primary topics covered. The program also included one lab per week. This offering was intended to provide a good foundation for those wishing to pursue careers in medicine, the sciences, and anyone wishing to improve their general problem-solving skills.

Geological Processes: A History of Earth, Spring, 2011-12

- Program taught by myself and a biogeochemist exploring the history of the Earth via some of the important processes that are studied by sedimentary geologists, geophysicists, and geochemists. Emphasis was given to reading and interpretation of primary literature during seminars and class discussions. Students also engaged in group projects based on synthesis of primary literature related to a geologic topic. Upper division projects also included a data collection and analysis component in topics such as grain-size/sedimentary environment correlations, and diatom analysis in several fluvial-estuarine transitions in Puget Sound. Numerous field trips were given in Washington state.

Landforms & Lifeforms, Fall and Winter, 2011-12

- Dual geology-ecology program taught in collaboration with a landscape ecologist exploring the connections between Earth surface processes and the organisms that live and interact with physical landscapes. This was a full-time, upper division program exploring topics in sedimentology, geomorphology, ecology, and biogeography. Program included field trips to the Columbia Plateau, Mt. Rainier, Washington coast, and Death Valley.

Introduction to Natural Science, Fall - Spring, 2010-11

- A team-taught, fully integrated program synthesizing topics in geology, chemistry, and biology. This thematic offering has focused on the history of life on Earth and how the respective disciplines are used in conjunction with one another to interpret the geologic record. Equivalencies in geology are Physical Geology and Historical Geology with topics in mineralogy, geochemistry, paleontology, and climate change emphasized throughout the year. Program culmination was series of field trips across Washington State, from the coast to the Columbia Plateau, and student projects in the Spring quarter.

Earth Matters: Geology and Chemistry, Winter-Spring, 2010

- Served as an instructor on topics in physical geology and geochemistry in a multidisciplinary program that was co-taught by a chemist. The two-quarter, sixteen credit program introduced students simultaneously to fundamental topics in geology and chemistry, and synthesized the subject matter by exploring the basic physicochemical composition and processes of the Earth. Field trips to Washington coast and Grand Coulee area (exploring alkaline lakes).

History of Life on Earth (Course Instructor), Spring quarters, 2008 and 2009

- Taught course that placed emphasis on important events in the formation and subsequent evolution of the Earth as expressed in the geologic record. Topics included the formation of the early Universe, solar system, and planets, the state of the early Earth, significant geologic events, and major radiations and extinctions throughout Earth's history.

Data Analysis, Laboratory Instructor (TA), Fall, 2006 - Winter, 2009

- Instructed students in two-hour sessions on topics in descriptive and inferential statistics, with emphasis given to the utilization of SAS, R, and Microsoft Excel in the management and analysis of a variety of statistical data. Topics included probability distributions, t-tests, one-way ANOVA, correlation, regression, and chi-squared analysis.

Physical Geology, Laboratory Instructor (TA), Fall-Spring, 2004-05

- Provided instruction in basic principles of physical geology, mineralogy, petrology, petrography, and the interpretation of geologic and topographic maps.

Pennsylvania State University, Abington, PA

Fall-Spring, 2007-08

Adjunct Instructor (assistant to ill faculty member)

Planet Earth, Fall-Spring, 2007-08

- Provided instruction in the interpretation of topographic and geologic maps, basic petrography and mineralogy, recognition of geologic structures, and plate tectonics.

ADVISING

The Evergreen State College

2010-present

Undergraduate Student Research in Geoscience

Advised students through the development and implementation of undergraduate projects to conduct a longitudinal survey of bathymetry, hydrodynamics, and sedimentation at several mud flats in the headward region of Eld Inlet, Puget Sound.

Geology Club

Served as a faculty mentor to the Evergreen Geology Club, a student-run organization, and served as the faculty sponsor for several of the club's regional field trips.

CURRICULUM
DEVELOPMENT

The Washington Center

2010-2011

Curriculum for the Bioregion Initiative: Building Concepts of Sustainability into Undergraduate Curriculum. A Faculty Learning Community in the Geosciences.

Crystallography for Chemists (and others!)

June 19-24, 2011

California State Polytechnic University, Pomona

NSF funded workshop to familiarize chemistry and other science faculty teaching mineralogy, crystallography, or solid state chemistry with the theory and laboratory methods of modern crystallographic analysis.

GRANTS

Collaborator on grant from CONICET (National Scientific and Technical Research Council of Argentina): "Análisis de ritmos mareales en el lapso Neoproterozoico-Paleozoico inferior del noa: Ciclos astronómicos, mareales y su influencia en la expansión de la vida Post-

Cambrica” (“Analysis of tidal rhythmites in the Neoproterozoic-Lower Paleozoic span of Northwestern Argentina: Astronomical cycles, tides, and their influence on the expansion of Post-Cambrian life”)

Principal Investigator: Dr. Vanina Lopez de Azarevich, CONICET, Salta, Argentina. For years 2012-2014. Funded: \$15,000 (USD).

Geological Society of America, Graduate Student Research Grant. 2008. “Analysis and implications of high resolution tidal deposits in Upper Cook Inlet, Alaska”

American Association of Petroleum Geologists, Grants-In-Aid Program. 2007. “Analysis of high resolution tidal deposits in Upper Cook Inlet, Alaska”

FIELD

EXPERIENCE

Dissertation Research

Cook Inlet, Alaska

August, 2007 and June to September, 2008 (and ongoing)

- Core sampling and reconnaissance of tidal deposits on the macrotidal mudflats of Turnagain Arm. Intensive study of fluvio-estuarine bar deposits appearing to display regular astronomically-driven periodicities. Millimeter-scale sampling of laminae thicknesses and grain sizes in rhythmites was performed, as was survey of larger-scale features, such as aggradation and preservation potential.

Paleoecology of Cretaceous-Paleogene Systems of southern New Jersey

Sewell, New Jersey

April to June, 2005, 2006, and 2007

- Worked on ascertaining stratigraphic position of paleontological excavation sites and obtaining sediment samples for palynological analysis in the marine sediments of the Late Cretaceous systems of New Jersey. Some of these assemblages have been recovered in sediments that lie quite close to the Cretaceous-Paleogene boundary and, thus, some of this work was concerned with characterizing either a latest Maastrichtian ecosystem or earliest Paleocene system.

Southern Patagonia Dinosaur Project

Southern Patagonia, Argentina

February and March, 2005 and 2006

- Worked on the excavation of a large sauropod from the fluvial deposits of the Pari Aike Formation in southern Patagonia. Performed quantitative quarry mapping for the purpose of a three-dimensional quarry reproduction and explored the depositional system and its fossils for the purposes of paleoecological reconstruction.

Bahariya Dinosaur Project

Bahariya Oasis, Egypt

December, 2005

- Participated in the Bahariya Dinosaur Project, helping to study some of the many coastal facies present there and the relation to dinosaur discovery sites. Also prospected for cyclic tidal rhythmites.

PROFESSIONAL

MEMBERSHIPS

Geological Society of America

Society for Sedimentary Geology (SEPM)

American Association of Petroleum Geologists

PROGRAMMING/
COMPUTING

C/C++, MATLAB, R, MAPLE, and SAS in Unix/Linux and Windows environments for modeling and statistical data analysis.

PUBLIC
OUTREACH

Science Cafe of Olympia. The Longer Day: How Rocks Can Tell Us About Changes in the Earth's Spin and the Moon's Orbit. October 12, 2010.