

College of Science and Health

SABBATICAL LEAVE APPLICATION

University of Wisconsin-La Crosse

Name: Kristofer Rolfhus

Telephone Number:

Rank: Professor

Department: Chemistry and
Biochemistry

Title of Project: Development of Laboratory Exercises for the Environmental
Chemistry (CHM 412) Course/Research Manuscript Preparation

Dates of Project: Spring semester, 2014

Location(s) of Project: Cowley Hall, UW-La Crosse

Date of Last Leave: none taken

Date of Last Sabbatical: none taken

Requesting: (check one)

Two (2) semesters

One (1) semester

Fall Spring

Please Check here that the following are included or are not applicable:

Current, brief CV

Letter of support from Department
Chair

Table of sabbatical costs and
possible funding sources

Letters of support from collaborators

Applicant's Signature _____ Date _____

I have sent a letter to the Dean of the College of Science and Health indicating how
courses would be covered during the sabbatical and what the associated
department costs would be.

Chair's Signature _____ Date _____

I. Abstract of Project

I am requesting a sabbatical leave for the spring of 2014, during which I propose to conduct two main activities: 1) develop a laboratory section consisting of approximately ten new experiments for the Environmental Chemistry course (CHM 412), and 2) composition of two manuscripts from our National Park-related contaminants research for submission to peer-reviewed journals in my field. Both tasks fulfill several important goals and criteria established by UW System and the College of SAH for sabbatical leave. I am not requesting any additional funding beyond my salary, and all activities will be conducted at UW-La Crosse.

II. Introduction

My teaching responsibilities

My teaching responsibilities are within the area of general and analytical chemistry, where I have regularly been teaching CHM 104 (General Chemistry II), CHM 301 (Analytical Chemistry), and CHM 412 (Environmental Chemistry). I typically have large lecture sections of ca. 100 students, and 2-3 lab sections of 24 students each week. The Environmental course typically has 18-30 students per section, and is taught once per year during the spring semester. This course is currently a 3-credit lecture-only format, and its modification is the basis for a portion of this sabbatical application.

Additionally, I usually have 2-4 undergraduates conducting research in my laboratory, with typically one student registering for a 1-2 credit independent study (CHM 489) project each semester. I have maintained full-time status since my arrival, and I have neither taken leave nor received a prior sabbatical appointment.

My research responsibilities

I have a broad and active research program, involving many undergraduates and a few graduate students from the Biology Department and the River Studies Center. My attached Curriculum Vitae indicates that I have been involved with bringing in nearly X dollars of extra-mural funding (both grant and contractual) since my arrival at UW-La Crosse in 2001. This work has translated into the publication or submission of X peer-reviewed research papers while at UW-L, as well as the presentation of X papers at professional meetings. My work has been recognized regionally, nationally, and internationally, and I have cast a wide net with my collaborations.

I study the geochemical fate and transport of the neurotoxin mercury in the environment (Wiener et al., 2012). I am interested in how the metal behaves from when it is first emitted from a smoke stack or tail pipe to where it is found in fish tissue being consumed by humans and wildlife. The chemical, biological, and physical factors involved in mercury's journey through the environment are quite complicated as you might expect, and there are many interested parties including the US EPA, State of Wisconsin, academics, health care workers, resource managers, and industry. My research is extremely inter-disciplinary and the related laboratory and field work lends itself nicely to the involvement of student assistants (Rolfhus et al., 2011). Indeed, I would argue that our undergraduates are conducting Master's level work at times, and are involved in all aspects of the scientific method.

I have most recently been involved in work investigating the extent of mercury and methylmercury contamination of aquatic systems within six upper midwestern National Parks, funded by the US EPA Great Lakes Restoration Initiative (“GLRI Project”). The Parks are interested in both the presence/absence of mercury “hotspots”, the presence of persistent and bio-accumulating organic pollutants, as well as the factors that lead to enhanced contamination of its resources. This nearly \$ X study involves multiple investigators from the River Studies Center, as well as 2 graduate students and approximately 15 undergraduate students. The project will officially end in early 2015.

III. Project Description

I propose to use the one-semester sabbatical appointment (Spring 2014) to achieve two major goals: 1) to develop a new full-semester laboratory unit for the CHM 412 Environmental Chemistry course, and 2) work towards completion of two first-authored manuscripts associated with the GLRI project in the National Parks. Details on these proposed endeavors are provided below.

a) Development of a Laboratory Unit for Environmental Chemistry (CHM 412)

As mentioned, the course is currently taught in a 3-credit, lecture-only format, offered once per year. Most of my students are Biology majors with environmental or aquatic science concentrations. The course content is extremely broad due to the nature of the field—I divide it into sections on contaminants, elemental cycling, atmospheric, aquatic, and terrestrial chemistry. Each of these sections could easily be an undergraduate course unto themselves. I have always been left with the impression that the depth of understanding of each section in this course could be greatly improved with hands-on training. There are a few other courses in Cowley Hall that have some laboratory relevance (CHM 301, Analytical Chemistry; CHM 441, Instrumental Analysis; BIO 447, Standard Methods and Quality Assurance of Water Analysis), but are not suitable replacements for our environmental chemistry topics.

I have discussed the possibility of increasing CHM 412 to four credits with the inclusion of the lab section with my department chair and environmental colleagues, and they are in support of this move. Further, our department has recently undergone significant changes to align with American Chemical Society accreditation standards, and there is a distinct need for additional upper-level Chemistry elective courses that offer a laboratory section.

I anticipate the development of approximately 10 lab experiments, all of which can be conducted with current Chemistry/Biochemistry and River Studies Center shared equipment. Given the departmental resources available, I am not including any request for funding for the lab development beyond my salary.

b) Completion of Two GLRI Research Project Publications

My research efforts over the past few years have focused on a project examining mercury and persistent organic pollutant contamination within aquatic systems of six upper-midwestern National Parks (see CV for details). This project, initiated in 2010, is set to end in spring 2015. It included three major field sample collections (May/June 2010-2012), and we are now in the sample analysis and laboratory experiment portion of the project schedule.

I anticipate requiring additional time to write two first-authored manuscripts for the project. The first manuscript will deal with the production of methylmercury and its incorporation into the lower food web of lakes and streams within the parks. This study is unique in both the type of measurements made and the large number of sample sites (25) investigated across the Great Lakes region.

The second paper will deal with experimental formation rates of methylmercury in soil samples that are periodically exposed to wet/dry cycles. Both manuscripts will represent significant contributions to the literature, and will be submitted to peer-reviewed journals such as *Environmental Science and Technology* or *Environmental Pollution*. I expect that each manuscript will require 2-3 weeks of intensive preparation, which should not interfere with the CHM 412 experimental development mentioned above. I have a significant and documented record of peer-reviewed publication while at UW-La Crosse, and I feel that this sabbatical request is appropriate for the work proposed.

IV. How the project meets UW System Sabbatical Guidelines

This proposal addresses three key aspects of the UW System Shared Learning Goals highlighted in the sabbatical guidelines. Three points deal with my ongoing research and subsequent publications: “**Knowledge of human cultures and the natural world**”, “**Interdisciplinary activity**”, and “**Collaborative program activities**”. My research is by nature interdisciplinary, as I currently work with three UW-La Crosse biologists and numerous National Park Service personnel with backgrounds ranging from geology to ecology to resource management. My research on mercury cycling in aquatic systems deals with biological, chemical, physical, and geochemical aspects of the environment, and requires a level of expertise in each of these areas.

The additional UW System Shared Learning Goals, “**Critical and creative thinking skills**”, and “**Effective communication skills**” are addressed by the curricular development of the CHM 412 laboratory section. Critical thinking is always the most difficult set of skills to develop, and the added lab exercises will include sections that require students to synthesize ideas, troubleshoot problems, and find new ways to get to the answers. For example, I typically incorporate sections on error analysis and a discussion of the sources of errors. Additionally, there will be written submission of a graded laboratory notebook and student writing assignments on how the lab exercise results relate to contemporary environmental topics such as climate change and water pollution.

V. How the project meets CSAH Sabbatical Guidelines

This sabbatical proposal relates directly to two SAH guidelines: “**The sabbatical project should enhance teaching, course and curriculum development and/or research or any other scholarly activities related to instructional programs within the field of expertise**”, and “**The sabbatical project should lead to results that are publishable in a reputable journal**”. I strongly believe that development of a laboratory section for CHM 412 will enhance the student learning experience, and provide much-needed depth to course topics. As mentioned, the manuscript preparation will (hopefully) lead to published results in journals pertaining to my research area.

VI. Estimated Budget

No funding beyond salary is requested.

VII. References

Rolfhus, K.R., B.D. Hall, B.A. Monson, M.J. Paterson, and J.D. Jeremiason (2011). Assessment of mercury bioaccumulation within the pelagic food web of lakes in the western Great Lakes region. *Ecotoxicology* 20(7): 1520-1529.

Wiener, J.G., D.C. Evers, D.A. Gay, H.A. Morrison, and K.A. Williams (2012). Mercury contamination in the Laurentian Great Lakes region: Introduction and overview. *Ecotoxicology*, 161: 243-251.

VIII. Letter of support from Chair—See Attached Document

IX. CV—See Attached Document