# RICHTER SCHOLAR PROJECTS – 2007

## ART

***Lecturer/Gallery Director Becky Goldberg***
***Durand Art Institute 303***
***Ext. 5194; email: goldberg@lakeforest.edu***

**Planning a Sesquicentennial Art Exhibit** (1 student)
Fall 2007 marks Lake Forest College's sesquicentennial. It is fitting that a special exhibition celebrating this event be mounted in the Sonnenschein Gallery. After much discussion, the following idea emerged. The gallery will showcase fine art, decorative art objects and bric-a-brac that was created during the time period that Lake Forest College began. A Richter Scholar would work with the Gallery Director to plan and organize this exhibition. The exhibition would open on Homecoming/Family weekend and run for approximately one month. The planning process for this project must take place this summer.

A logical starting point for objects to include would be the College's own art collection as well as the holdings of the Special Collections department in the Donnelley and Lee Library. The plan also is to involve alumni, trustees, and faculty in this exhibition. This would entail identifying what types of things should be included in the exhibition, finding out who has what is needed and requesting that items be loaned for this purpose.

A Richter Scholar would assist in all of these activities: determine the scope of the exhibition, select objects from the College's art collection and Special Collections Department that would be appropriate, work with the Alumni Office to identify who might be willing and able to lend items, solicit loans via letters and phone calls, generate didactic materials for the exhibition itself.

The following qualities are necessary for the successful completion of this project: the person selected should be well organized, possess strong written and verbal communication skills, have an interest and background in art/historical materials, and think creatively.

## BIOLOGY

***Professor Shubhik DebBurman***
***Johnson Science Building-A 201***
***Ext. 6040; email: debburma@lakeforest.edu***

**Discovering Molecules That Combat Protein Misfolding Linked to Neurodegeneration**

During summer 2007, the DebBurman lab seeks two or three highly motivated, hardworking undergraduates to join a diverse group of five other peers, who collaboratively study how certain disease-linked proteins misfold and if such folding errors can be suppressed or reversed. To fold correctly, most proteins require chaperones, which are proteins that help other proteins fold into their proper shapes and maintain their shape. If proteins still misfold, they are targeted for destruction by the ubiquitin-proteasome complex. But some misfolded proteins that such escape quality control, build up in tissues and cause tragic incurable diseases.

With the aid of national grants, we have focused on the protein folding mysteries underlying one such illness: Parkinson Disease (PD), which is caused by the misfolding of the protein, -synuclein. This misfolding somehow selectively kills nerve cells, which then lead to PD symptoms. We hypothesize that chaperones, and enzymes of the ubiquitin-proteasome pathway, lysosomal degradation pathway, and oxidative damage pathway can regulate mechanisms underlying the misfolding of -synuclein. To test this hypothesis, we have chosen to work with two types of yeasts as model systems and we utilize techniques in molecular genetics, cell biology, and biochemistry. Students choose from several ongoing hypothesis-driven projects and enjoy significant control over experimental design. Richter students will attend a prestigious scientific summer conference in Chicago in May as part of their introduction to biology research, and they will learn to present scientific journal clubs and lead data discussions at weekly lab meetings. Many past students continued working additional years in these projects. Some expanded it into a senior thesis, which they presented at national conferences. Recently, nine students, including two past Richter Scholars, became published co-authors in research articles published in a major scientific journal, and all lab graduates have pursued PhD, MD, or master degrees in other health professions.

Pre-requisite: BIOL120, Bio Core Seminar, and CHEM110 & 111.

***Professor Caleb Gordon***
***Johnson Science Building J-307***
***Ext. 6051; email: gordon@lakeforest.edu***

**Stopover Ecology of Migrating Woodland Birds** (1-2 students)
The notion that a 10-gram bird would make a thousand mile journey twice a year seems unbelievable, and yet *most* of the bird species that breed in North America engage in such seasonal migratory activities. Understanding the ecology of migrating birds *during* their migration is critical for understanding the life histories of these birds, and for their conservation. As a Richter scholar under this project, students will participate in an intensive bird-banding study that I initiated in 2002, targeted at 1) monitoring long-term and continent-wide population trends in North American migratory birds; and 2) understanding the "stopover ecology" of migrating birds as they pass through Lake Forest during spring migration. Students selecting this project should enjoy working outdoors in moderately strenuous and very muddy conditions, and be willing to wake up very early most days during the second half of May. Students will learn how to operate mist-nets and handle live birds in the field, including identification, weighing, banding, and physiological and reproductive condition assessment. This project involves many volunteer banders from the local community as well, and so an interest in working with the

public, and helping to train and coordinate volunteers is also desirable. This project will involve two weeks of intensive field work at a Lake Forest nature preserve in the second half of May, followed by data entry, analysis, and research. The precise topic for research is flexible depending on students' interests, and will represent an opportunity for students to become involved in publications, presentations and/or continued research on migratory bird ecology.

***Professor Karen E. Kirk***
***Johnson Science Building-D 235A***
***Ext. 6044; email: kirk@lfc.edu***

**Telomeres: Harbingers of Age and Immortality** (1-2 students)
In order to understand the process of cellular immortalization, many cancer biologists study telomeres, the protein/DNA complexes that protect the very tips of eukaryotic chromosomes. Telomere structure is altered in cancer cells, and it has been hypothesized that this change is part of the tumorigenic process. Evidence for this potential role stems from the finding that telomeres are shorter in cells with limited replication potential (most normal human cells) and longer in those that can divide for numerous generations or indefinitely (germ, stem, or cancer cells). Although shortened telomeres and reduced replication potential is a normal part of the aging process in humans, aberrant telomere lengthening may be part of the molecular mechanism needed for cells to turn cancerous.

In my lab, we seek to learn more about telomere function by using a genetic model organism called *Tetrahymena*. We mutate the telomeric DNA sequence in the living cell and ask how this mutation perturbs various aspects of cell growth and nuclear division. Our studies indicate that mutated telomeres are rapidly degraded, leading to deprotected chromosome ends and most likely to chromosomal fusions. In response to these events, the cell cycle appears to arrest in mid-anaphase of mitosis. We are now trying to better understand the molecular mechanism that results in such devastating cellular consequences.

Students in my lab learn how to design and execute experiments utilizing state-of-the-art molecular and cell biology techniques, and often present their findings at scientific conferences and in co-authored manuscripts. Most students continue their projects during subsequent years. Candidates must have completed at least one semester of biology and one year of basic chemistry.

***Professor Douglas Light***
***Johnson Science Building-D 230***
***Ext. 6039; email: light@lakeforest.edu***

**Regulation of Cell Volume in Red Blood Cells** (1 student)
I study problems associated with animal physiology and homeostasis, mainly focusing on membrane transport mechanisms and signaling processes at the cellular level. Currently, I am looking for students interested in investigating the physiological basis of cell volume regulation. The ability to control size is a fundamental property of cells and is one of the oldest regulatory

mechanisms from an evolutionary standpoint. In fact, many of the mechanisms involved with cell volume regulation also are associated with important biological phenomena, such as activation of white blood cells, regulation of the cell cycle, and programmed cell death. Nonetheless, the underlying mechanisms used to regulate cell volume are ill defined.

Students conducting research in my laboratory will perform novel experiments, which will lead to new findings that can be presented at regional and national meetings. These studies also may result in student-faculty co-authored publications in scientific journals. Students have the option of continuing with these studies beyond the summer so they may become the basis of a senior thesis.

Specifically, my research incorporates several complementary experimental approaches, using fish, amphibian, or reptilian red blood cells as model systems. These include hemolysis experiments to examine osmotic fragility, electronic sizing of cells to determine their volume, and fluorescence microscopy to monitor intracellular calcium. The specific lab procedure(s) used by students will depend on individuals' particular interests. Given the nature of these studies, a minimum of Biology 120 and Chemistry 110 is required; having a full year of both Biology and Chemistry is strongly encouraged.

***Professor Pliny A. Smith***
***Johnson Science Building-A 209***
***Ext. 6049; email: smith@lakeforest.edu***

**Genetics of Cell Fate Decisions** (1-2 students)
The students should have completed Biol 120, Organismal Biology. The research that I would like to share with my students concerns one of the fundamental processes of biology, the changes required for an embryonic cell to become specialized. Specifically, we will study the genetics of cell fate decisions, i.e., the genetic program that is activated when a generic cell transitions to a muscle cell.

I propose to teach the students how to identify variations of genes (alleles) that affect the process of development in the small nematode, *Caenorhabditis elegans*. I have observed that undergraduate students receive insights into both biology methods and experimental thinking by participating in genetic projects similar to the one I propose.

While I have expertise with the *C. elegans* pharynx (the nematode's foregut), the project allows a potential student the flexibility in deciding his or her own focus. For example, a student may decide to investigate the genes required to generate the pharynx cuticle, the equivalent to a human stomach, or perhaps study the genes required for connection of the pharynx to the intestine. In all cases, the student would examine worms that have been randomly mutated and identify a few worms with characteristics that they have predicted would arise from the deficiencies they have chosen.

Once a mutant allele has been identified, the student would map the physical location of the mutation in the worm's genome using Polymerase Chain Reaction (PCR). Thus, the student

knows the gene responsible for the change in appearance (phenotype) that he or she observed. Once this point is reached, the student's aim is to connect the function of the newly identified gene/allele with the scientific literature concerning cell fate specification. To accomplish this goal, the student would use modern genetic, cell, and molecular biology techniques available at Lake Forest College such as RNA interference (RNAi), *in vivo* protein detection (immuno-fluorescence or GFP-fluorochrome microscopy), and genetics. The project, as most of science, is open-ended and may be continued by future students.

## BUSINESS

***Professor Les Dlabay***
***Young Hall 304***
***Ext. 5145; email: dlabay@lakeforest.edu***

**Project 1: Monetary Systems of Africa: An Analysis of Economic, Political, And Cultural Influences On Exchange Rates and Currency Design** (1 student)
The Central Bank of West Africa States issues a monetary unit used by the African Financial Community, which consists of Benin, Burkina Faso, Guinea Bissau, Côte d'Ivoire, Mali, Niger, Senegal, and Togo. The Central Africa CFA franc is used by the countries in the *Coopération financière en Afrique centrale* (Financial Cooperation in Central Africa). This currency is issued by the BEAC (*Banque des États de l'Afrique Centrale*, i.e. "Bank of the Central African States"), located in Yaounde, Cameroon. In addition, the euro and U.S. dollar continue to be the unofficial currency in many African business settings, which is commonly referred to as informal *dollarization*—the use of a country's currency in another country. These varied monetary arrangements provide the foundation for regional economic integration. However, historic colonial influences and ongoing political disagreements create a very unstable environment for economic development, business opportunities, and international trade.

Richter Activities

1. IDENTIFY KEY ISSUES, CREATE FRAMEWORK related to historic, economic, cultural, and political influences of paper currency and monetary systems in Africa.

2. LIBRARY, WEB RESEARCH to prepare summaries of background information regarding monetary systems in various regions of Africa.

3. INTERVIEWS with people familiar with the culture and business environment in various African countries.

4. PLAN WEB SITE format and content with resources related to monetary systems and banknote design in Africa.

**Project 2: Informal Economic Activities: Survival Employment in Developing Economies** (1-2 students)

Informal enterprises involve pushcarts, street vendors, temporary open-air stands, and peddlers on foot as well as unregistered offices, in-home stores, and home-based factories. Many of these businesses are characterized by transient facilities, limited product lines, emphasis on perishable items, negotiated pricing (bargaining and barter), and untaxed revenues. The informal economy is known by many names, including the *shadow economy*, the *underground economy*, the *parallel economy*, and the *black market*. In many developing economies of Africa, Asia, Eastern Europe, and Latin America, the informal economy can involve between 40 percent and 60 percent of the workers.

Richter Activities

1. SUMMARIZE DATA AND FINDINGS of previously-conducted research on informal economic activities in Africa, Asia, Eastern Europe, and Latin America.

2. REFINE ANALYTIC FRAMEWORKS to identify characteristics, causes, and consequences of informal economic activities in Africa, Asia, Eastern Europe, and Latin America.

3. CONTINUE LIBRARY, WEB RESEARCH to obtain information regarding informal economic activities in Africa, Asia, Eastern Europe, and Latin America.

4. CONDUCT INTERVIEWS with people familiar with the culture, political situation, business environment, and microfinance activities in Africa, Asia, Eastern Europe, and Latin America.

5. PLAN WEB SITE format and content related to informal economic activities in Africa, Asia, Eastern Europe, and Latin America.

**PROJECT 3: Microfinance And Microenterprise Activities Of NGOs and FBOs In Developing Economies** (1 student)

Small loans (usually less than $50) can provide opportunities for the development of business enterprises in the emerging economies of Africa, Asia, Latin America, and Eastern Europe. As governments are rethinking foreign aid programs, other alternatives are emerging to enhance quality of life and to stimulate long-term economic development. An extensive number of NGOs (non-governmental organizations) and FBOs (faith-based organizations) have provided funds and occupational training for the creation of home-based businesses in these geographic regions. This effort has also been evident in major U.S. cities when working with various ethnic groups who desire to develop a stronger economic base in their communities.

Richter Activities

1. IDENTIFY KEY ISSUES related to microfinance and microenterprise initiatives to enhance economic development in emerging markets.

2. CREATE ANALYTIC FRAMEWORK to identify cross-cultural influences on planning and implementing microfinance and microenterprise programs in various geographic regions.

3. LIBRARY, WEB RESEARCH to prepare summaries of background information regarding microfinance and microenterprise programs of NGOs and FBOs.

4. CONDUCT INTERVIEWS with people familiar with cultures, business activities, and microfinance programs in various cultures and ethnic groups.

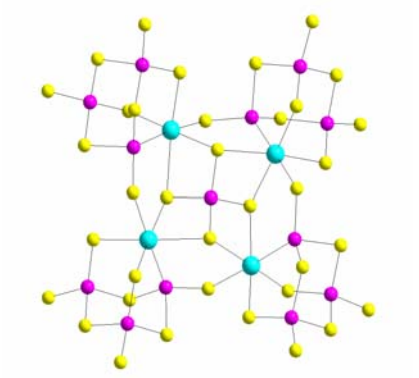
5. CONDUCT FIELD OBSERVATIONS of ethnic retailing enterprises, informal economic activities, and cultural activities in Chicago and the suburbs.

6. PLAN WEB SITE format and content related to microfinance and microenterprise programs of NGOs and FBOs.

## CHEMISTRY

***Professor Jason Cody***
***Johnson Science Building-A 305***
***Ext. 5093; email: cody@lakeforest.edu***

**Making New Molecules in Ionic Liquids** (1-2 students)
Building new molecules is the heart of chemistry. Before the properties of new materials can be measured and the first applications can be imagined, the molecules must be made. In my laboratory, we are investigating reactions of metal atoms with phosphorus, sulfur, and selenium. The reactions will be carried out in low-melting salts known as ionic liquids as solvent. This



relatively new area of chemistry has received much attention recently because these solvents don't boil, don't burn, and can substitute for other more hard to handle liquids. Because some of the materials decompose in air, precautions must be taken with these materials to work with them under conditions where oxygen and water are excluded. Thus, we will use special laboratory techniques for handling such air-sensitive materials. Subsequently, we will study the structure of the products using X-ray diffraction. With this technique, we can learn the exact molecular structure. The figure shows a never-before-seen ion, $[Ni_4P_{13}S_{36}]^{7-}$, that was prepared in my laboratory at the end of last summer. My student and I will present these exciting new results in the spring at a national meeting.

The Richter Scholar will participate in every aspect of this project, working with me to formulate goals and experiments. Careful record keeping, enjoyment from working with one's hands, and imagination are keys to the success of this project. The project will conclude with a written

summary of results and suggestions for future experiments. One year of college chemistry is a prerequisite.

***Professor Lori A. Del Negro***
***Johnson Science Building-A 311***
***Ext. 5094; email: delnegro@lakeforest.edu***

**Chicago Benzene and Air Toxics Sampling** (1 student)
The U.S. Clean Air Act currently regulates 188 hazardous air pollutants (HAPs) or "air toxics", volatile compounds with known adverse human health effects. Of these 188, 18 were targeted in 2002 as the most important, and these formed the basis of a 10-city pilot study by the EPA. Among the 18 priority air toxics were benzene, 1,3-butadiene, formaldehyde, and a variety of halocarbon gases. In combination with the EPA's 10-city Pilot Study, recent work has used background measurements of air toxics at remote sites to assess the contribution of background air toxic levels to the total population exposure. Recent studies demonstrate considerably lower background levels than in previous studies, but the background concentrations are still worthy of concern. In the case of benzene, background levels contribute at least 13% of total benzene in most urban areas, and background levels are greater than or equal to the levels deemed to pose a one in a million risk of lung cancer for those exposed over a 70-year period. The city of Chicago was not one of the 10 cities to take part in the EPA pilot study; therefore, estimates of benzene exposure in and around Chicago are based on model results and very few empirical measurements.

A Richter Scholar participating in this project will work on a combination of laboratory studies and fieldwork. Laboratory activities will focus on the preparation and measurement of calibration standards and blanks needed to validate the measurements of ambient concentrations made in the field. Fieldwork will build on sampling performed by Frank Pierri ('07) as part of his senior thesis, focusing on transects to the north and west of Chicago to determine the gradient in benzene concentrations as a function of distance from urban point and area sources. Students will be using a combination of techniques for the collection and analysis of air samples, including Solid-phase microextraction (SPME) and whole air sampling with cryogenic preconcentration, followed by gas chromatography/mass spectrometry. Students considering this project should have an interest in the chemistry of environmental issues, the ability to work outdoors in a range of weather conditions as well as in the laboratory, careful attention to detail, and a *mastery* of the gas chromatography concepts presented in CHEM 111 in the spring semester and the concept of calibration presented throughout the first year of chemistry.

***Professor Dawn Wiser***
***Johnson Science Building-A301***
***Ext. 5092; email: wiser@lakeforest.edu***

**Chemistry, Computers, Calculations: The Convergence of Science, Technology, and Math in Industrial Applications** (1 student)

My research uses computer modeling to understand how the structure of a catalyst can affect the outcome of a catalytic reaction. The reactions of interest are called asymmetric reactions and are important to the pharmaceutical and petrochemical industries.

The recent availability of powerful and affordable desktop computers makes computer modeling of molecules a powerful research tool for chemists in industry and academia. Although the insight gained by computer modeling is remarkable, the full utility of this tool is realized only when computational results are combined with appropriate laboratory data. Richter scholars participating in this project will be directed and closely supervised by me, and will work closely with my upper level research students to gain valuable experience with the use of computer modeling here at Lake Forest College. Once appropriate data has been collected, students will have the opportunity to interact with my collaborators at the University of Chicago and the University of Wisconsin at Madison.

The goal of my research is to understand how to optimize the synthesis of metallocene and hydroformylation catalysts in order to increase their availability for use in the manufacture of specialty polymers and in pharmaceutical research. The project involves exploring the structural and energetic aspects of a series of known catalysts and then using this information to guide the synthesis of new catalysts. The project also involves the development of new methods to model chemical structure and energy.

A student working on this project will perform molecular modeling calculations using a variety of computer programs running on Mac OS X, Linux, and Unix operating systems. Interested students will gain valuable experience in understanding chemical structure and in developing skills in the area of computer modeling. The project is suitable to students interested in the intersection of chemistry, computers, mathematics, and/or physics. Necessary prerequisite material includes introductory chemistry and a willingness to use Macintosh, UNIX, and PC computers. As with all research, there will also be a significant amount of literature research.

## COMMUNICATION

***Professor Rachel Whidden***
***Young Hall 418***
***Ext. 5128; email: rwhidden@lakeforest.edu***

**How Risk is Communicated to the General Public** (1 student)
Specifically I am looking at the case of vaccines and how risks of particular vaccines are communicated, or not communicated, to the public. Many people are probably familiar with recent media attention given to the possible links between certain vaccines and instances of autism. But this is not the first time that vaccines have come under fire. For more than 100 years, doctors have been publishing articles in medical literature about the brain-damaging side effects of vaccines. For example, the mother of all vaccines, the smallpox vaccine, was found to cause inflammation of the brain in one in 3,200 persons. Also, after Pasteur began to inject

patients with rabies vaccine in the 1880s, it became obvious that brain inflammation was a side effect that affected as many as one in 400 vaccinated persons. And by the 1960s and 1970s, the medical literature was full of reports that the pertussis (whooping cough) vaccine was causing brain inflammation and death in babies getting the DPT shot. Doctors and health officials were discussing these things on the pages of their journals, but those being vaccinated had no idea that such side effects were allegedly going on.

My research involves investigating this controversy. In particular I am interested in how it is that the public has somehow been misinformed or under-informed. Of course there are multiple sides to this controversy and I am studying the way that the risk of vaccines is communicated by all sides.

This summer I need help gathering and synthesizing materials for this project. While I am a communication professor, I do not necessarily request to work with a communication major. In fact, I imagine that students with a wide-variety of majors might be interested in this project, as it deals with issues of science, politics, public policy, religion, and philosophy. I will require a student who is competent in researching on the web as well as online databases. I will need someone to collect and sort through materials. In addition, I expect that this student will be able to read Congressional testimony and understand how to cite a variety of sources in MLA format.

## ENGLISH

***Professor Davis Schneiderman***
***Carnegie Hall 206***
***Ext. 5282; email: dschneid@lakeforest.edu***

**Project 1: Memorials to Future Catastrophes** (1-2 students)
Along with Professors Don Meyer (Music) and Tom Denlinger (Art), I am preparing a multimedia project to be realized on the web and with physical materials. The project will ultimately consist of a multimedia DVD and seed packet; the DVD will allow users to view 6 audio-visual "catastrophes" over a 12-month period, and two years hence, harvest the fast-growing plants (from the seed packet) to make their own paper.

At that time, users will be given access to a website with further text to be printed on the specially made paper, and this text will be viewable only in hard copy. This hard-copy story will provide electronic codes to unlock further audio-visual catastrophes from the website, which can be viewed with further self-made paper over a total period of 32 years.

This collaboration merges time-extended art with the an audio/visual/tactile experience—serving as a "Catastrophe" occurring in the present, representative of a socio-political climate increasingly cordoned off by the representative fears of terrorism, bio-disease outbreaks, and natural disasters.

The ideal student will have some familiarity with web-design (not an absolute requirement), along with interest/experience in sound recording, film editing, and multimedia production (to help generate the DVD packaging and procure raw visual materials). This project will extend in many directions, and an ambitious student can help move it forward through research, production, and promotional initiatives. The project will also provide opportunity for the student to directly collaborate in the creative aspects of the work.

**Project 2: Literary and Cultural Copyright** (1-2 students)
I am continuing research on a large project considering literary copyright and literary theft, within the context of contemporary issues of corporate ownership (music downloading, fan fiction, etc.). This project calls for a student interested in collecting material on the development of literary copyright, the rise of the "author" over the past 2000 years, as well as the implications of ownership standards on consumerism. The Richter Scholar will help catalogue instances of "theft" in literary work (specifically in the texts of William S. Burroughs), and will explore underground communities involved in web "fan fiction" (writing one's own Harry Potter tale, for instance). Familiarity with one or more of these communities would be welcome (but certainly not required).

This work will dovetail with other multimedia issues: for example, the musician Beck routinely "samples" from a variety of sources for each of his albums. Backed by a large record company (Geffen/BMG), he is able to cover the copyright usage fees. In 1998, a group of underground musicians released a CD called *Deconstructing Beck*, which mixed Beck songs *without* clearing any fees. Beck's label threatened to sue the makers of the CD, until the company realized that public debate about the way transnational capital/money authorizes only certain people to make sample-driven music was exactly the point of the *Deconstructing Beck* project. Thus, this Richter project will entail making connections between the literary and cultural spheres, and may also involve interviewing professionals in the field of copyright law (professors, lawyers, etc).

The ideal student will be motivated to develop her own research directions, and will be interested in linking literature to broader social enterprises.

## HISTORY

***Professor Steve Rosswurm***
***Young Hall 515***
***Ext. 5151; email: rosswurm@lakeforest.edu***

**"Frog Island" (Waukegan, Illinois)** (1-3 students)
This research project, part of a larger study of Afro-Americans in Waukegan, focuses on "Frog Island," a small, clearly defined area on the city's west side. Although it maintained its coherence and integrity for only a short time -- from the early 1920s until the mid-1950s -- Frog Island has a remarkable history both in-and-of-itself and in what it contributed to Waukegan.

The lives of the members of this community intersected, moreover, with many significant events in US history: the Great Migration from the South during and after World War I; World II and the consequential economic boom and housing expansion; the Civil Rights movement in the 1960s.

We will dig deeply into the life of Frog Island and re-create as much of its history as we can from among the following sources: the Sanborn Fire Insurance Maps (which describe each house); the city directories (which give names and occupations by address); and, mostly important, the 1920 and 1930 Federal census (which provide great detail for each and every person living in Waukegan). We also will do research in the Chicago Tribune, the Waukegan Historical Society, and the Waukegan Public Library. We might do some oral histories.

***Professor Voula Saridakis***
***Young Hall 512***
***Ext. 5150; email: saridaki@lakeforest.edu***

**King Charles II's Patronage of the Sciences** (1 student)
My research project for the summer is a continuation of last year's Richter project. The project will develop into an article on King Charles II's (r. 1660-85) patronage of the sciences (especially astronomy) in late seventeenth-century England. Upon his restoration to the throne of England after the English Civil War, Charles II became a great patron of the arts and sciences. Among other things, he is known for founding the Greenwich Observatory near London for improving English navigation. He also sponsored the founding of the Royal Society of London in 1660 to promote scientific research (a society that still operates to this day).

The Richter Scholar would have the opportunity of assisting me with my ongoing research of both primary (locating manuscripts and archival work) and secondary sources using the Internet and materials found in local libraries. The student would also accompany me to these libraries if necessary. The student would prepare a bibliography of relevant sources and images, and meet with me on a weekly basis to discuss the material. There are no language requirements, although some coursework in history is highly desirable. Moreover, the ideal student would have an interest and willingness to immerse herself or himself in historical research. I hope that by assisting me with this research, the Richter Scholar might discover her or his own ideas about a variety of historical topics including royal patronage of the sciences and the history of the sciences in Restoration England.

## DONNELLEY AND LEE LIBRARY

***Academic Technology Specialist Connie Corso***
***Donnelley and Lee Library 235***
***Ext. 6124; email: corso@lakeforest.edu***

**Developing Workshop Materials** (2 students)
This summer I will be developing materials necessary to offer IT workshops to faculty, staff, and students. In preparation for the workshops it is necessary to research and evaluate commercially available training materials appropriate for the users. Existing materials may need to be modified or new materials created. Under my guidance, the Richter Scholar will research, evaluate, recommend, and create training materials for the following workshops: Microsoft Word 1 & 2, Microsoft Excel 1 & 2, Microsoft Access 1 & 2, Microsoft PowerPoint 1 & 2, Introduction to Moodle, Moodle Grading, Intermediate Moodle Workshop, Introduction to GIS. The Students will not only be creating paper-based materials, but also web-based training materials as well. The completion of this project will result in interactive web-based training as well as structured course materials for instructor-led classroom training.

The students should have experience with the Microsoft Office Suite and a willingness to learn Microsoft FrontPage, Microsoft Access, Adobe Photoshop, Adobe Creative Suite, Dreamweaver MX, Flash MX, SnapShotz, and Moodle.

## MUSIC

***Professor Don Meyer***
***Reid Hall 106***
***Ext. 5171; email: meyer@lakeforest.edu***

**Launch a New Web-Based Academic Journal on Experimental Music** (1 student)
Along with my colleagues Kirk-Evan Billet and Dave Amrein, I am exploring the possibility of launching a new web-based academic journal devoted to Experimental Music. Tentatively called *Playing Music*, the journal will feature articles about the history and current practice of experimental music along with original compositions from practitioners in the field. All compositions published through this journal would be required to be registered at Creative Commons, an alternate copyright office dedicated to the free exchange of art and ideas. The music and activities published in the journal would thus be free to the readers of the journal, who would hopefully make use of these in their own ensembles. The journal would also publish electronic music, with the invitation to the readers to remix the music and re-publish it with the journal.

The Richter Scholar would be involved with this project on several levels: researching the history and current practice of experimental music; researching other literary and music journals we might want to emulate (or somehow collaborate with); creating the initial web page template for the journal; and other projects related to the creation of the journal.

The Richter Scholar should have taken at least one music theory course during his or her first year, should have background in (or strong interest in learning about) web design, and should have an interest in both music history and composition. The Scholar could work with me in either of the two sessions, but I would prefer the first session.

# PHYSICS

***Professor Nathan Mueggenburg***
***Johnson Science Building-A 130***
***Ext. 5164; email: mueggenb@lakeforest.edu***

**Compaction of Granular Materials (**1 student)
At first glance it may seem that granular materials are rather simple. They are merely a collection of discrete macroscopic particles. We encounter such materials quite often as we go about our daily lives. We use salt at the dinner table, and we walk across the sand at the beach. Farmers store and transport grain and the pharmaceutical industry mixes and packages powdered medicines. Yet, such prevalence in our society does not imply simplicity, and does not imply that these materials are well understood. This project explores one aspect of the unusual behavior of granular materials.

Unlike ordinary solids and fluids, the density of a granular material is not a static property of the material and its current environment, but also depends on the history of the packing. We encounter this phenomenon when we open a new box of cereal, and find the container nearly half empty. Lest we think that we have been ripped off, the side of the box has a disclaimer stating that some settling may have occurred during shipping. Vibrations during transport cause the particles to rearrange and result in a more compact configuration. The number of particles in the box has not changed, but the density of the packing has increased. This concept of compaction, is ubiquitous in granular materials, and is crucially important in engineering.

A Richter scholar will explore the phenomenon of granular compaction with controlled laboratory experiments. Using an electromagnetic shaker (similar to a speaker) the student will test the dependence of compaction on the distribution of particle sizes and on dilatancy (the idea that in order for the packing to rearrange, it must be able to expand). Some knowledge of general physics will be useful, but the student does not need to have had extensive experimental or theoretical training. He/She needs only a desire to understand the physics behind this common, but perplexing phenomenon.

***Professor Scott Schappe***
***Johnson Science Building-A 107***
***Ext. 5166; email: schappe@lfc.edu***

**Measuring Lighting Efficiencies** (1-2 students)
Approximately 25% of all electrical power generated in the United States is used to generate light. The ubiquitous incandescent lamp is woefully inefficient: only about 6% of the electrical power going into the lamp emerges as visible light. Large-scale fluorescent lamps do better with an energy efficiency of about 30%, but with poorer light quality. Using more efficient lamps would decrease the detrimental environmental effect caused by the coal-burning plants that provide most of our electrical power.

For many devices, determining the efficiency is a relatively simple matter of measuring the power output and dividing by the power input. For lighting, however, the issue is more complex: the only valuable part of the output is the light visible to the human eye. Furthermore, the eye is not equally sensitive to all wavelengths of light; for example, to create the appearance of an equal amount of illumination, more red light would be required than green light.

In this project we will measure the effective illumination versus power input for a variety of lamps: standard incandescent, halogen, mercury fluorescent, and LEDs. This entails measuring the amount of light at different wavelengths and weighting them according to the eye's sensitivity and taking into account the spatial distribution of the light: some lamps (like incandescents) emit their light into all directions relatively equally; others, like LEDs, emit primarily in one direction. By observing the lamp emission spectra, we will also make judgments about the light quality.

Students must have taken Phys 111 or Phys 121 (possibly Phys 106); Math 110 would be beneficial.

## POLITICS

***Professor James Marquardt***
***Young Hall 421***
***Ext. 5126; email: marquard@lakeforest.edu***

**Proposal 1: Transparency discourse in U.S.-China relations** (1 student)
This summer research project is an investigation of relations between China and the United States since the end of the Cold War. It focuses on America's calls for China to be "more open and transparent." That is to say, for the sake of lasting peace and security in the Asia-Pacific region, the United States maintains that China must be more forthcoming with its neighbors about its internal affairs. China being more open and transparent, America insists, will help clear up the suspicions states in the region have about China's intentions and, thereby, reduce regional tensions.

I hypothesize that America's transparency policy vis-a-vis China is part and parcel of a strategy of primacy. The goal is to contain China's growing power and influence in the region and draw it into an American-inspired system of world order, one that makes China accountable to its neighbors. A more open China, along the lines suggested by the U.S., would be a China subject to the watchful gaze of the United States and, therefore, constrained strategically and politically. A China that resists military transparency would sharpen concern about its intentions throughout the region and have the effect of casting doubt on China's claim that it seeks to be a normal, status quo power. In effect, transparency is a tool to preserve American primary in world politics.

The Richter Scholar will assist me in the collection and analysis of primary documents on this subject from American and Chinese (English language) sources, focusing mostly on U.S. efforts

to encourage China to make its legal system, trade regulations, and military matters more open to outsiders. He/she will also survey the literatures on China's international relations and Sino-American relations over the past twenty years.

My goals are a draft chapter for a book manuscript, a conference paper, and a co-authored publishable article.

**Proposal 2: U.N. Conventional Arms Transfer Registry, Freedom, and Economic Growth** (1 student)
Professor Rob Lemke (Economics and Business Department) and I have complied data on over 100 countries, comparing their levels of internal freedom with their participation in a U.N. program for reporting information on imports and exports of conventional armaments. Our 30-page research paper surveys the results of the data analysis from 1993 to 2005. The student involved in this research project will gather additional data and conduct research on the participation of select countries in the U.N. arms registry. Country case studies will be drawn from across regions but likely cases include the United States, Cuba, Russia, Moldova, Israel, China, India, Iran, Brazil, and South Africa.

Our goal is to revise the current paper, using new quantitative and qualitative data collected by our Richter scholar, and submit one or two new papers for peer review in international relations and economics-oriented policy journals.

This project is ideal for students interested in the study of international relations, politics, and economics. Students with knowledge of Excel are especially encouraged to apply, but an Excel background is not required.

## PSYCHOLOGY

***Professor Robert Glassman***
***Hotchkiss Hall 11***
***Ext. 5257; email: glassman@lakeforest.edu***

Our long-term memories are vast - so why is the capacity of immediate memory only about seven independent items - the so-called "magical number 7±2"? Indeed, under attention-absorbing conditions our capacity is even smaller – only about three or four. Are we so "narrow-minded" because of limitations of brain function? Or did working memory capacity evolve small because of the logic of cognition, for example in speaking and reading sentences? Is short-term memory capacity the same in people as in other animals? What are our brain waves doing while we are remembering?

**Project 1: Computer programming for human brain wave recording and analysis** (1 student)

Help develop programs written in LabVIEW, a computer language that is almost entirely iconic, or pictorial. The programs record EEG activity during various memory tasks, and analyze the brain waves ~~~~ to see if they have properties analogous to musical harmonies. (During the summer of 2006 Chris Hartley made good progress, while learning about digital signal processing. Talk to him! During the summer of 2005 Richter Scholars Jenny Brown and Leland Humbertson worked on a related project. Talk to them!) If you like becoming absorbed in puzzle solving you will love these programming jobs.

**Project 2: Do crayfish have a memory?** (1 student)
An animal that has as much brain as a crawdad ***must*** have a memory! For several years we have tried to demonstrate that, but we still need to figure out "how to think like a mudbug." Maybe this is the year we will crack this mystery. (During the summer of 2006 Stephanne Levin taught some of these creatures to anticipate a food reward. Talk to her! Liz Birnbaum and Courtney Barry are now working on it. During the summer of 2005 Richter Scholar Marina Pinayeva developed new techniques for behavioral testing of crayfish. Talk to her!) If you are also interested in recording brain waves from crayfish, you can put in extra time learning the fine art of microsurgery.

**Project 3: Foreign language learning and working memory capacity** (1 student)
In learning Russian, I've been struck by differences and similarities with English and by our recent-memory limitations in sentence construction. For example, after just barely being able to respond to the request (on a language-learning CD) to say in Russian "I have to go downtown" (5 words) I was able to respond correctly to the request to repeat that while adding, in Russian, "…to exchange money at the bank" (6 words in Russian, though the meanings distribute differently than in English). What do language teachers and students observe more generally about how many words they can "hang onto at once" in attempting to organize a sentence while learning a language? To what extent is this impacted by the additional memory load when you need to change the ordering of words in the other language or when you struggle to choose the correct one of two words that sound alike? Are there additional hints about these memory-load questions in the way languages form certain plurals – for example, why are there two different forms in Russian for the plural of the English word "years"? Developing these questions and finding some answers may provide a key to the mind!

***Lecturer Burt Krain***
***Hotchkiss Hall, Room 304***
***Ext. 5247; email: krain@lakeforest.edu***

**(Burt Krain, Ph.D., CPT is the Director of Human and Organizational Performance, Human Performance Center located at Naval Training Center, Great Lakes Telephone: 847-688-5450)**

**Proposal 1: Navy SEAL Selection, Naval Service Training Command, Great Lakes** (1 student)
Navy SEAL Selection Program: As part of an effort to increase the success rate of Navy SEALS (the U.S. Navy's elite fighting force) through their training program, this project seeks to

determine those characteristics of "mental toughness" or the "heart of the lion" that makes SEALS candidates successful in completing the program. Currently, approximately 75% of the enlisted candidates and 25% of the officer candidates drop out of training for reasons that are a combination of physical conditioning and mental toughness. Our project is exploring the cognitive and personality characteristics that contribute to a candidate's success in completing this rigorous training program. We have developed a battery of cognitive and personality measures and we are currently in the process of analyzing the data for its predictive success. At the same time, we are trying to develop a set of training materials to increase the probability of training completion through the introduction of those materials to candidates found to be at risk of dropping out of the training pipeline.

Interested students need a curious and creative mind to help identify those characteristics that would help to fortify the "at risk" candidates and help them succeed in the training pipeline. Between two and three students would be required to analyze SEAL data, search for applicable training materials to strengthen their "mental toughness" and allow them to successfully complete SEAL training. With the War on Terrorism in full swing, this is a high visibility, high profile project that has substantial patriotic rewards for those willing to undertake playing a part in improving SEAL performance. This will be a fun and memorable project for anyone interested in a challenging assignment. The opportunity to write and co-publish papers exists for the right Richter Scholars.

**Proposal 2: Development of a Navy Enterprise Competency Model for the Total Force, U.S. Navy, Great Lakes** (1 student)

This is a cutting edge project to develop a set of competencies for the U.S. Navy's Total Force, including officers, enlisted, reservists, civilians, and contractors. Over the last three years I have researched a set of tools to develop a competency model for the U.S. Navy. Recently, these efforts have been recognized by the top Admirals of the Navy and they are currently sponsoring an effort to extend this work Navy-wide. The Richter Scholar(s) assigned to work with me on this project would get involved in data analysis, focus groups, developing a competency data dictionary, and validation of the competencies identified by prior research. This project has extremely high visibility, is cutting edge in its design and has gained increasing recognition for its possible applications. This is a "get your hands dirty", very practical, and very rewarding assignment. Past efforts have found Richter Scholars heavily engaged in making significant contributions, writing technical papers for publication and presenting their findings to high level naval officials.

**Proposal 3: Science of Learning and Human Performance Projects for the U.S. Navy** (1 student)

The Navy's Human Performance Center is the largest human performance improvement organization of its kind in the country. The role of the center is to identify areas of organizational improvement and provide analysis of problems identified. Staffed with behavioral scientists, industrial/organizational psychologists and educators, we tackle such problems as the impacts of automation and self-paced instruction in the classroom, qualifications for perishable skills such as marksmanship, swimming, and cardio-pulmonary resuscitation. We are currently studying the impact of student hand-held responder technology in the classroom. We apply the science of learning to understand the underlying issues associated with students failing to achieve their

goals in the Navy. One or more Richter Scholars would engage in working with experienced professionals on such assignments as running focus groups, gathering data through field observation and interviews, and writing up their findings in technical reports, with the possibility of publishing their findings or making presentations to Navy leadership.

**Interested students with backgrounds in psychology, anthropology, sociology, economics, English and creative writing would thrive in this work environment. A curious and analytical mind is the prerequisite for being considered.**

All of these projects are located at Great Lakes Naval Training Center, approximately 10 minutes north from Lake Forest College, with easy access to the Naval Base.

**NOTE:** The cost of transportation to and from the Naval Training Center is the responsibility of Burt Krain and the Richter Scholar(s).

## RELIGION

***Professor Ron Miller***
***Reid Hall 207***
***Ext. 5175; email: rmiller@lakeforest.edu***

**Edit William James *The Varieties of Religious Experience*** (1-2 students)
William James is our most important American philosopher, and at the turn of the 20th century he was teaching in three departments at Harvard: philosophy, psychology, and anatomy. And yet, even though he never taught religion, his classic, *The Varieties of Religious Experience,* (1902) is arguably the most important book written on religion in the 20th century.

The book is difficult to read in its entirety and my goal is to edit the book, choose the most important passages, and publish them with a facing page commentary. I could use one or two Richter Scholars to help me both in the selection of the passages and in researching the material needed to write the commentary.

## SOCIOLOGY AND ANTHROPOLOGY

***Professor Holly M. Swyers***
***Hotchkiss Hall 200***
***Ext. 5252; email: swyers@lakeforest.edu***

**Why Are We Here? The changing social role of American post-secondary education** (1-2 students)
Over the course of the last half-century, the United States has experienced what one sociologist has labeled "credential inflation" (Collins 1979). Jobs that formerly required high school

diplomas have increasingly become jobs that require bachelor degrees, and, as we are seeing today, master's degree programs are proliferating across the country to keep up with demand. Intersecting with this trend has been a significant 30-year trend away from a Fordist-Keynesian economic structure toward what David Harvey refers to as "flexible accumulation" (1989). This has produced a restructuring of high school curricula across the United States away from traditional vocational training toward college preparatory courses for a very high proportion of students. Finally, shifting demographics, including substantial gains in both life expectancy and retirement ages, have contributed to a pattern of "prolonged adolescence" (Blos 1954) that has become more the rule than an exception.

The combination of these trends appears to have led to a change in the social role of colleges and universities in the United States. It also appears to have significantly altered the composition of and the expectations of college student populations at most post-secondary institutions. My summer project is to begin research on what precisely is going on in the post-secondary sector. Has there in fact been a trend of changes, or are we participating in a larger cycle of education developments? If there have been significant changes, as I suspect is the case, what is the role of post-secondary education in the early 21st century U.S.? And what, ultimately, has this done to change the expectations and preparation levels of students? My long-term goal for this project is an historically informed ethnographic study of the college experience in the first decade of the 21st century. I anticipate that the results of this study will be an important contribution to the efforts of colleges and universities to adapt to the perceived changing times, contributing both to the overall health of the nation's post-secondary education sector and to the more personally relevant issue of addressing student expectations without losing the rigor traditionally associated with a college degree.

This long-term project is in its preliminary stages, and the work I anticipate for this summer strikes me as an excellent opportunity for a Richter Scholar (or two) to get a sense of what the ground floor of a long-term project looks like. My goals for the summer include:

1. a review of contemporary literature, to identify what scholars and educators perceive as changes in the landscape of higher education

2. a decade-by-decade historical survey of perceived higher educational issues of the 20th century for the purposes of trend analysis

3. a first stab at category creation for methodological purposes. I anticipate two cross-cutting types of categories: a) the school level (e.g., community colleges, liberal arts colleges, state colleges, etc.), and b) the student level (e.g., first generation, recruited athletes, traditional, etc).

This work is particularly appropriate for Richter Scholars on a variety of fronts. Both the literature review and the historical survey will produce significant findings in their own rights and will allow the scholar a sense of accomplishment. The early methodological work will give students a sense of research design and give me an opportunity to discuss category creation with people who are within the population I intend to research. Their insights into how categories are

felt by current college students will be invaluable for thinking through the construction of the next phase of research.

The student collaborators in this work should be interested in education (education studies types in particular would be good choices) and have taken Introduction to Sociology and Anthropology.

## THEATER

***Professor Dennis Mae***
***Hixon Hall 202***
***Ext. 5141; email: mae@lakeforest.edu***

**Project 1: Visual Research** (1-3 students)
This Richter Scholar would research the historical, political and cultural influences as well as the visual elements as background for one of the 2006-2007 Garrick Players productions. The student would serve as an assistant to the designer. The objective of this project is to generate research documentation and analysis for one or more of the three major productions, each set in a different time period. The student may also assist in the creation of set renderings and costume plates for the production. A short paper may be presented by the student at the panel discussion after the final performance. Research materials will also be part of a lobby display on the historical period of the play. No special skills are required but an interest or ability in illustration could be a plus.

**Project 2: Making a Musical** (1 student)
This project consists of research on and adaptation of an accepted classic stage work into a contemporary musical theater work. Titles under consideration include: "The Would-be Gentleman" by Moliere, "She Would if She Could" by Etheredge, and others, including student suggestions.

Research includes standard dramaturgical inquiry into the literary and production history of the work(s) chosen. Period versus contemporary production options are to be explored.

Student(s) will assist in the selection of songs, song placement in the text, text editing, lyric writing/adaptation, etc.

Performance and/or publication is an expected outcome of this project.

and two titles from 2003 could resurface as options:
Dennis Mae Theater Research in American Scenic Design
Dennis Mae Theater Research in American Music Theater

***Professor Richard Pettengill***
***Johnson Science Building-B 157***
***Ext. 5148; email: pettengi@lakeforest.edu***

**Project 1: Put Together a Book Proposal for Publishers** (1 student)
For my book project, *Wild Shakespeare: Radical Stagings into Film*, which deals with various productions that began onstage and were eventually made into films, I need help putting together a book proposal and sending it out to various publishers. How is it that the most innovative directorial approaches to Shakespeare – often controversial when first put on stage – end up making their way to film and video and long-term critical acclaim? This project looks at a number of radical reinterpretations of Shakespeare by major directors – including Peter Brook's *King Lear*, Richard Loncraine's *Richard III* (starring Ian McKellan), and Julie Taymor's *Titus*. I'm tracing not only the genesis of each concept and the stage to screen process, but also the critical reception of both versions of each production. This is ultimately a study of artists in an ephemeral medium seeking a form of immortality, of directors working to ensure the cinematic permanence of work that would otherwise have disappeared forever.

**Read and Edit Essays** (1 student)
For a volume of essays I am editing, tentatively entitled *Interdisciplinary Approaches to Performance Studies*, I need a student to help me with the task of reading submitted essays, making editorial suggestions to the authors, and the many tasks associated with such a project (such as the creation of an index). The newly emerging field of Performance Studies embraces not only the study of "aesthetic performance," i.e., theater, music, dance, etc., but also examines the rituals and play of everyday life as performance. This volume reflects the interest of scholars from a number of disciplines (including English, Theater, Music, Dance, Sociology, Anthropology, and Philosophy) in viewing the world through a Performance Studies lens.

**Record and Edit Chicago Theater Productions** (1 student)
For the Lake Forest College Chicago Theater Video Archive (a project funded by the U.S. Department of Education), I need a student who can use high quality digital equipment to record selected theater productions in Chicago theaters, and can edit them on iMovie/iDvd. We also need to work with the Donnelley and Lee library to create labels and packaging so that these DVDs can be cataloged and made available for viewing.