

INTERDISCIPLINARY OPPORTUNITIES MINI-GRANTS

Project Title: Development of an interdisciplinary First Year Seminar Course on Disease and Culture

Institution: Furman University

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Amount requested: \$8486.50

Date grant submitted: 10-6-2006 for planning only

Proposed grant period: January 2007 – January 2008

Type of project: course planning and development

Signature of faculty submitting proposal _____ Date _____

Signature of faculty submitting proposal _____ Date _____

Name of appropriate dept. chair: Dr. Joe Pollard (Biology) and Dr. David Shaner (Philosophy)

Name of Chief Academic Officer: Dr. Tom Kazee

Signature of above chair or officer _____ Date _____

Signature of above chair or officer _____ Date _____

Signature of Chief Academic Officer _____ Date _____

Evidence of institutional support is required for each curricular mini-grant proposal in the form of a letter of support from the proposal author's Department/Division Chair. For co-curricular proposals institutional support is required in the form of a letter of support from the faculty/staff mentor/sponsor and a letter from the chief student affairs officer. All proposals must be signed by the chief academic office.

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Date received _____ By _____

Date sent to review Committee _____

Action _____ Notification sent _____

SUMMARY

Furman University will require incoming first year students to participate in a First Year Seminar (FYS) program beginning in fall 2008. The ultimate goal of the FYS program is “to introduce students to the intellectual life of the liberal arts college.” Students and faculty members in the seminar should strive to foster qualities and skills such as enthusiasm for learning and reflection, critical consideration of established knowledge, critical evaluation of preconceptions and assumptions, and appreciation of the research process. Though undoubtedly admirable, it will be challenging to reach these objectives in one course taught by one faculty member trained in one discipline. Therefore, we, a microbiologist and a philosopher, propose to develop and teach an interdisciplinary FYS course on Disease and Culture. The preliminary objectives of this interdisciplinary course are (1) to use the study of significant diseases to arouse students’ curiosity and interest in the scientific bases and cultural, historical, and societal impacts of diseases, (2) to enhance students’ understanding and appreciation of the research process, and (3) to use established scientific knowledge as background to critically and ethically evaluate preconceptions and assumptions. To better prepare ourselves for the course, we decided to be each other’s student. Our plans include Dr. Worth spending 2.5 weeks in summer 2007 in Dr. Liao’s research lab learning microbiology/molecular biology techniques and helping pre-run the kits to be used for the course and Dr. Liao engaging herself in extended humanistic and ethical dialogues with Dr. Worth throughout the year. Immersing ourselves in each other’s discipline by learning from each other and experiencing the challenges students in our class may encounter will better prepare us to teach the course. Together we will develop detailed lesson plans, activities and materials that will ultimately guide the course. We anticipate that this course will be challenging, yet intellectually stimulating for the students. Additionally, we hope that the

interdisciplinary approach and the collaborative relationships will serve as an inspiring model to other faculty members at Furman University.

PROJECT DESCRIPTION

Goals and Objectives. The goal of this proposal is to develop of an interdisciplinary First Year Seminar (FYS) course on Disease and Culture through the collaborative effort of two faculty members with distinctly different disciplinary backgrounds. We believe that a team approach to course development will result in course content and teaching approaches that will broaden and enhance student's learning experience by extending their ability to appreciate various disciplinary perspectives. Such is the impetus that brought a microbiologist and a philosopher together to propose, develop, and teach an interdisciplinary FYS course. This interdisciplinary teaching approach will underscore the importance of learning various perspectives of a topic and impress upon students the interdisciplinary way of learning. Having developed this learning attitude in the first year will ameliorate their learning experience in subsequent years. We believe this type of collaborative and interdisciplinary interaction in and of itself is a powerful demonstration to students and to faculty colleagues that focused, interdisciplinary, team approaches to the pursuit of knowledge is at the core of a liberal arts education.

This goal positions us to explicitly address ACS's definition on "interdisciplinary" as our objectives for the course development. We will design our sessions and assignments to be co-facilitated as we plan to be present in every class/session and to grade and evaluate students as a team. This grant award would provide the financial support necessary to prepare us to fully function as a team in teaching this course. By this we mean: (1) plan every lecture together to avoid unilateral decisions, (2) spend significant amount of time developing detailed lesson plans so each class session appropriately interweaves our disciplines to achieve balance and minimize

and appearance of “proprietary” disciplinary ownership, and (3) learn from each other and develop an understanding of each other’s texts and perspectives. We believe meeting these planning objectives will lead us close to our overall aim of helping students gain an understanding of the complexity of the relationship between science and culture and how seemingly simple biological anomalies can have such a big impact on the way we live our lives.

Background and Campus Context. Furman University’s pedagogical model of “engaged learning” offers students opportunities to develop skills in problem-solving, critical-thinking, experience-based education. Simultaneously, this model challenges professors to develop courses and research programs that strive to meet the goals of “engaged learning.” In spring 2006, with the mission of “engaged learning” in mind, faculty members at Furman University voted to change the structure of the traditional general education requirements (GER) program that artificially compartmentalizes the experiences of a liberal arts education merely into courses offered by different departments. The faculty at large agreed that the GER program is meant to facilitate “students' understanding of the transferability of intellectual processes and knowledge across contexts whose complexity may supersede the boundaries of individual departments or disciplines” and to bring “a greater variety of intellectual perspectives into meaningful dialogue with one another, thus highlighting for students both the complementarity and the uniqueness of departmental and disciplinary voices.” The goal of this new program is “to foster the capacity to integrate knowledge across disciplines while still respecting disciplinary expertise and authority.” The objectives of Furman’s new distribution requirements program certainly encourage faculty members from different disciplines to develop interdisciplinary courses.

Interdisciplinary courses and research programs are not new to the Furman campus. A year long interdisciplinary sequence in the humanities (with representatives from English,

History, Religion, MLL, Classics, Communication Studies, and Philosophy) has been one of the most successful interdisciplinary courses on campus for several decades. The River Basins Research Initiative (RBRI) program encompassed by professors in Chemistry, Biology, and Earth and Environmental Sciences departments has been supported by numerous state and federal grants. Over 150 undergraduate students have been involved in this research program, resulting in 75 presentations at professional meetings and 11 publications in peer-reviewed journals. However, the aforementioned interdisciplinary collaborations are not as dramatic and challenging as what we are proposing to do. The collaboration of a microbiologist and a philosopher is unique. This collaboration will extend Furman's institutional commitment to "engaged learning" of students to "engaged learning" of faculty members as we try to learn from each other. It will demand both the students and the faculty teaching the course to expand disciplinary boundaries that generally stay somewhat rigid in a standard college course.

Detailed interdisciplinary plan. The bottom-line of our plan is to have a philosopher spending time at the bench of a molecular biology lab and a biologist engaging in extended humanistic dialogues. This opportunity of being each other's student and teaching each other will help us identify difficulties our students may encounter in the class and enable us to design our lesson plans in such a way that potential pitfalls can be lessened, if not eliminated. Dr. Liao has tentatively identified ten diseases of historical, cultural, and societal significance and numerous laboratory exercises to make the course hands-on and experience-based. The diseases on this tentative list are: plague, AIDS, sickle cell anemia, malaria, smallpox, leprosy, syphilis, hemophilia, Irish potato famine, and tuberculosis. There are several rationales for choosing these diseases. First, we want a diversity of diseases, so infectious diseases of humans and plants, as well as genetic disorders are chosen. Second, we want to choose diseases with significant

historical and political impacts. Third, there are linkages between some of these diseases. For example, the descendents of plague survivors are more likely to be HIV-positive but AIDS-free. The gene responsible for sickle cell anemia has been kept in the human population by the selection pressure of malaria. Additionally, it is speculated that syphilis in the Old World may have been confused with leprosy. Fourth, we want to choose diseases that provide students an opportunity to discuss significant ethical considerations such as with the Tuskegee syphilis experiment. Fifth, we want diseases that will expose students to different areas of biology. For example, sickle cell anemia and hemophilia will give us an opportunity to talk about genetic disorders; sickle anemia and malaria will give us an opportunity to talk about evolution; AIDS and tuberculosis will give us an opportunity to talk about the human immune system; AIDS and smallpox will offer students an opportunity to understand diseases with immediate relevancy because AIDS is becoming epidemic and smallpox is a potential biological weapon.

Though all aforementioned diseases have educational value, a cursory study of these diseases is not our course objective. We plan to invest time and effort for at least one year to:

- (1) Identify and select diseases from the list that help students understand the relationship between such diseases and their socio-cultural implications;
- (2) Increase our familiarity with the literature and texts from biology and philosophy to enhance our cross-disciplinary facility and unfold critical interdisciplinary points of reference;
- (3) Design engaging classroom activities and writing intensive assignments that increase students' understanding and appreciation of the issues, concepts and research processes associated with diseases and their cultural impact;

- (4) Allow each of us to explore the other's disciplinary milieu (inclusive of visiting each others' classes, the philosopher working in the biology lab, and the biologist participating in ethical dialogues, etc.);
- (5) Begin experimental co-facilitation of several sessions and pre-testing of sample assignments; especially those that use established scientific knowledge as background to critically and ethically evaluate preconceptions and assumptions;
- (6) Share our experiences with colleagues to reveal our reflections and experiences, inspire others who are developing interdisciplinary FYS, and reach out to other faculty who share interests in disease and culture.

Prior activities or research. This is the first time Dr. Liao or Dr. Worth has tried to collaborate with a colleague of distinctly different discipline in a truly interdisciplinary manner. However, Dr. Liao was Dr. Worth's student when she audited Dr. Worth's Introduction to Philosophy course in fall 2004. Dr. Worth has laid the foundation of methodologies and terminology in Philosophy upon which Dr. Liao will develop in-depth understanding of related disciplines.

Project timetable. Throughout the year, we will meet regularly to narrow down the selection of diseases, to identify appropriate texts for students, and to develop thought-provoking assignments and activities. We will look for opportunities to pre-test activities, materials and team-teaching strategies in each other's classes as appropriate. Laboratory work will be conducted in summer of 2007. Our final report will be in the form of Furman course proposal that include information such as the course description, the principal topics, and the approximate time devoted to each topic. In addition, plans for dissemination of our experience to colleagues at Furman and in other professional settings will be detailed.

Requested Budget

1.	Course development stipend for summer 2007		
	Dr. Min-Ken Liao	\$2500.00	
	Dr, Sarah Worth	\$2500.00	
	Benefits (FICA)	\$386.50	
2.	Summer research experience for Dr. Worth	\$1300.00	Kits from EDVOTEK and laboratory supplies not used in general biology labs
3.	Books and media	\$400.00	Representative books and films that have been identified as worthy of review
4.	Conference Presentations and Travel	\$1400.00	To be finalized during the course of the project
	Total	\$8486.50	

Budget Notes:

2. Kits from EDVOTEK, a biotechnology education company, that are suitable for Dr. Worth's training and are potential kits to use in the Disease and Culture course that need to be tested first are: what does DNA look like, how does a doctor test for AIDS, in search of the sickle cell gene, clinical diagnostic immunoblot, DNA-based screening for smallpox as a biodefense strategy, PCR-based Alu-Human DNA typing, sequencing the human genome, PCR-based VNTR Human DNA typing, RT-PCR: A model for the molecular biology of HIV replication, detection of a simulated infectious agent as a biological weapon, etc. Other laboratory exercises Dr. Worth will be involved in are: cloning, transformation, restriction mapping, sequencing, etc.
3. Representative books and films that have identified as worthy of review: The Power of Plagues by Sherman, Why We Get Sick by Nesse and Williams, Mountains Beyond Mountains by Kidder, When A Gene Makes You Smell Like A Fish by Chiu, And The Band Played On (DVD), Disease And History by Cartwright, Angels in America (HBO DVD), AIDS (Frontline Special). Additional materials that would be supported through Furman University Library purchases.
4. To be finalized during the course of the project – ASMCUE (American Society for Microbiology Conference for Undergraduate Educators), workshops or meetings of ACS (Associated Colleges of the South), AIS (Association for Integrative Studies) conference, Teaching Philosophy, SoTL (Scholarship of Teaching and Learning) conferences, and related disciplinary and interdisciplinary conferences and workshops, etc.

Context of interdisciplinary offering in curriculum. This FYS course will meet the objectives of Furman's new GER program and reach the institutional and pedagogical goals of "engaged learning."

Anticipated impact on the discipline, the institution, and the students. We have no doubt that our students will be challenged by the course content that spans across dual disciplines and by the classroom discussion and writing assignments that demand them to evaluate and examine established knowledge critically. This course will not only change our students' perspective on the topic, but due to the intensive and frequent interactions that we will have, it will inevitably change the way we teach our own courses and conduct our own scholarly activities in the future. Furthermore, we hope the productive interaction of a biologist and a philosopher will bridge the gap of underlying misunderstandings that often exist between science and the humanities not just at Furman but at other universities. By sharing our experience of an anticipated successful interdisciplinary collaboration to design and teach this new course we hope to inspire more faculty members of different disciplines everywhere to work together.

Evidence of institutional support. Please see the supporting letter from chairs of both departments. In addition, the Biology Department will provide basic laboratory space, equipment, and supplies in summer 2007. We hope the funding of this grant proposal will help us gain the visibility and credibility needed to request institutional support in the form of full, teaching credit (instead of half) in each discipline; recognizing this as one of the ACS definitions for an interdisciplinary model.

EVALUATION, DISSEMINATION, AND CONTINUED SUPPORT

Success of this course will be measured by the student evaluation forms used by all faculty members at Furman University and by an evaluation process specifically developed for this course with the assistance of the Center for Teaching and Engaged Learning at Furman University to encourage reflection and help students to articulate the interdisciplinary insights they have gained from the course. Additionally, we will invite our department chairs and

colleagues to attend a few sessions. We will compile feedback from our students and colleagues by the end of 2008. Opportunities to share with Furman Faculty colleagues will be facilitated through Furman's Center for Teaching and Engaged Learning. Extending into other professional arenas, our current time line allows for the submission of an abstract to the annual meeting of American Society for Microbiology Conference for Undergraduate Educators, which is due in February, and to an appropriate workshop or meeting of the Associated Colleges of the South. A faculty member in the Biology Department at Swarthmore College, intrigued by our process and focus of this course, has already extended an invitation for us to present our experience and outcomes. Additionally, we anticipate submitting a manuscript to journals such as the *Journal of Microbiology*, *Biology Education*, *Focus on Microbiology Education*, *Teaching Philosophy* or the *Chronicle of Higher Education*.

Finally, it is our understanding that the better planned and executed a course is from inception, the more likely it will be successful and remain as a regular First Year Seminar offering. A well-developed course generally allows for the additional opportunities to grow in new directions, informed increasingly by additional disciplines. We see the proposed endeavor as the first step. Having completed our own interdisciplinary team-teaching exploration, we will be well positioned to invite colleagues to join us. From within the course context, we envision inviting guest lectures from faculty in other disciplines (e.g., someone who studies the history of disease, the history of food and food-borne illness, ethics of medicine, medical anthropology, etc.). Successful additions may evolve into new course directions, new teams, and even new courses. In this way, we see our small course development experiment as having the potential to grow well beyond the two of us and the walls of our classroom.

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Education 45.2 (1996)

MIN-KEN LIAO

EDUCATION:

B.S. Plant Pathology National Taiwan University, Taipei, Taiwan, 1986
M.S. Microbiology University of Illinois at Urbana-Champaign, 1989
Ph.D. Microbiology University of Illinois at Urbana-Champaign, 1993
Postdoctoral Research Fellow University of Illinois at Urbana-Champaign, 1996

EMPLOYMENT HISTORY:

2003-present Associate Professor of Biology, Furman University, Greenville, South Carolina
2000-2003 Assistant Professor of Biology, Furman University, Greenville, South Carolina
1996-2000 Assistant Professor of Biology, Hope College, Holland, Michigan

EXTERNAL SUPPORT (SINCE 2000)

Merck/AAAS Undergraduate Science Research Program. 2005-2008. Co-investigator
NSF/REU. 2005-2008. Senior investigator
National Institutes of Health/South Carolina Biomedical Research Infrastructure Network SC-BRIN 5 P20 RR 1646-01. 2004. Principle investigator
NSF/MRI DBI-0216120. 2002-2003. Principle investigator.
NSF/REU. 2000-2004. Senior investigator
NSF/MRI #0116487. 2001-2002 Senior investigator

PEER-REVIEWED PUBLICATIONS (SINCE 2000)

Taylor, S. K., C. R. Arnold, A. T. Gerds, N. D. Ide, D. L. Kling, K. M. Law, L. J. Simons, J. R. Vyvyan, M. -K. Liao, and T. E. Goyne. 2004. Lactone synthesis *via* biotransformations of g-hydroxyamide. *Tetrahedron: Asymmetry* 15(24):3819-3821
Brown, Beverly, Fan, Sam, To Issacs, LeLeng, and Liao, Min-Ken. 2003. "Tree of Life: An Introduction to Microbial Phylogeny" *In Microbes Count!: Problem Posing, Problem Solving and Peer Persuasion in Microbiology*, Jungck, JR, Fass, MF, and Stanley, ED, eds, Canterbury Press, NY, p 191-202. Distributed by ASM Press ISBN 0-9723211-0-1
Liao, M. -K., and S. Maloy. 2001. Substrate recognition by proline permease in *Salmonella*. *Amino Acids* 21(2):161-174
Liao, M.-K., K. Law, and R. Lamb. 2000. A Start-up Manual for Undergraduate Research Students in Microbiology: Active Learning from the Very Beginning. *Education Instructional Library of American Society for Microbiology* May, 2000

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- poster presentation at Association of Southern Biologists Annual Conference. (Honorable mention)
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- Azize, J., M. Pierson and M. -K. Liao. 2004. Comparison of the phylogeny and horizontal gene transfer of *Escherichia coli* isolates at Furman University. Abstract and poster presentation at SACNAS National Conference
- Lewis, G. P*, C. B. Andersen, D. Haney, M. -K. Liao, S. Muthukrishnan, K. A. Sargent, J. Wheeler, and S. Wheeler. 2004. Urban influences on river chemistry and biology in the upper piedmont of South Carolina. Oral presentation at American Water Resources Association annual meeting
- Campbell, R., G. Lewis, M. -K Liao. 2004. Trends of free-living and attached coliform and *E. coli* upstream and downstream of a wastewater treatment plant on the Enoree River in Upstate South Carolina. Abstract and paper presentation at Association of Southern Biologists/Beta Beta Beta Southeastern Region Conference.
- Cook, E., R. Campbell, M. -K. Liao. 2004. Characterizing Antibiotic Resistant *Serratia marcesens* in Watersheds of Upstate South Carolina Abstract and paper presentation at Association of Southern Biologists Annual Conference. (Honorable mention)
- Tynan, J. 2004. The disposal of microbial waste: Is current laboratory practice adequate? Abstract and poster presentation at Association of Southern Biologists/Beta Beta Beta Southeastern Region Conference
- French, D. and E. Hubbard. 2004. Effectiveness of contact lens solutions in inhibiting bacterial growth. Abstract and poster presentation at Association of Southern Biologists/Beta Beta Beta Southeastern Region Conference. (Third place)
- James, K., M. -K. Liao. 2003. Analysis of the genetic diversity of the endangered plant, the Bunched Arrowhead, *Sapittaria fassiculata*, E. O. Beal, using ISSR. Abstract and poster presentation at Association of Southern Biologists Annual Conference. (Honorable mention)
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Sarah Elizabeth Worth

Current Position

Associate Professor of Philosophy, Furman University, Greenville, SC.

Education

Ph.D. May 1997. State University of New York at Buffalo (1994-1997)

Dissertation: "Fiction, Belief and Emotive Response"

Director: Carolyn Korsmeyer

M.A. University of Louisville (1992-1994)

Thesis: "Plato's Imitative Republic"

Directors: John Floodstrom and Eileen John

B.A. Furman University (1988-1992)

Majors: Music, Philosophy

Fellowships and Awards

CAP Sabbatical Grant for 2005-2006.

National Endowment for the Humanities Summer Institute: "Art Mind and Cognitive Science,"
College Park, MD. Summer 2002. Directors: Jerrold Levinson (University of Maryland,
College Park), Jenefer Robinson (University of Cincinnati) and Dominic Lopes
(University of British Columbia).

Visiting Scholar, Spring Semester 2002, University of Michigan. Under the direction of Kendall
L. Walton, Charles Stevenson Collegiate Chair in Philosophy.

Finalist: John Fisher Memorial Prize, offered by the *Journal of Aesthetics and Art Criticism* and
the American Society for Aesthetics, for "Aristotle, Thought and Emotion: Our
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Publications

Journal Articles

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DISCLOSURE STATEMENT

Dr. Min-Ken Liao will also be studying (1) the structure and function of the active site of proline permease in *Salmonella enterica* Serovar Typhimurium, (2) the genetic diversity of bunched arrowhead, and (3) the isolation and characterization of tetracycline-resistant *Escherichia coli* in recreational water. The first project is funded by Education and Research Consortium of the Western Carolinas, the second project is partly supported by Department of Natural Resources, and the third project is funded by Merck/AAAS undergraduate science research program. A grant proposal, prepared by three Biology faculty members and two Earth and Environmental Sciences faculty members, on “bacterial contamination and eutrophication of Furman Lake: an interdisciplinary study of potential contributing factors: was submitted to ACS Undergraduate Collaborative Scholarships Research Grants. I am also in the process of developing a course on Human Genetics and a course on the Philosophies, Theories, and Biology of Traditional Chinese Medicine. I have received institutional support in the form of reduced teaching load for the course development.

Dr. Sarah Worth is currently engaged in no other grant applications.