

Proposal to Establish An Interdisciplinary Ph.D. Specialization
Program for Interdisciplinary Environmental Research (PIER)

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Table of Contents

Executive Summary

A. Introduction

- A1. Aims & Objectives
- A2. Historical background
- A3 Rationale for new specialization
- A4. Relationship to existing programs at UCSD
- A5. Relationship to existing programs at other institutions
- A6. Program administration
- A7. Evaluation plan

B. Program

- B1. Overview
- B2. Admission requirements
- B3. Program of study
- B4. Program opportunities & other requirements

C. Faculty

- C1. Number of faculty
- C2. Key PIER faculty

D. Resource requirements

E. Appendices

- E1. List of faculty members
- E2. Letters of support from participating departments
- E3. Course list
- E4. Examples of IFER events
- E5. Examples of Group Projects
- E6. Examples of Internships
- E7. Students currently on the PIER track
- E8. IGERT students on the PIER track

Program for Interdisciplinary Environmental Research

Interdisciplinary Graduate Specialization in Environmental Research

PIER

Executive Summary

Accelerating environmental concerns are increasingly requiring professional skills that span the natural and social sciences, yet most graduate work is still focused on individual disciplinary themes. *We propose to train a new generation to develop real solutions to today's pressing environmental challenges.* Solutions cut across traditional disciplines and integrate science, economics, human social systems, and policy. Interdisciplinary knowledge, both theoretical and practical, is required to understand the full dimensions of environmental decision-making. The PIER specialization seeks to train leaders who will generate the interdisciplinary knowledge needed to analyze and manage the impacts of humans and climate change on the environment.

The proposed program responds to the UCSD Strategic Plan's grand research theme: *Understanding and Protecting the Planet.* It will nurture and support a collaborative and interdisciplinary research culture that advances the frontiers of knowledge, shapes new fields, and disseminates discoveries that transform lives. The specialization formalizes cross-disciplinary research across UCSD's natural sciences, social sciences and humanities related to environmental themes. Graduates will learn to communicate effectively about environmental change, develop economically viable solutions grounded in science that will enhance the resilience of society and the environment, recommend necessary policy changes and assess their economic and cultural impacts.

The PIER Specialization program consists of a 16-unit required summer course, a minimum of 8 units from a secondary field (outside the student's home department) and 6 units from the environmental research forum. There is no overlap between the PIER course work and department requirements. However, based on our experience with a similar IGERT program, this comprehensive track will take no more than one extra quarter to complete compared to the duration of the standard Ph.D. program offered by the home departments.

All Ph.D. students will be admitted through one of the participating home departments. Except for SIO, all participating departments currently require completion of core courses prior to application to PIER. Each participating department or faculty advisor as a commitment to the program will provide summer stipend support for their student. These can be donor funds, department funds, faculty funds, fellowships or any combination. PIER will provide summer fees for students admitted to the program. PIER is not intended to be a funding mechanism but an acknowledgement of a student's breadth of interdisciplinary training. The specialization will pursue funding options for participating students including NSF-NRT training grants donor support and San Diego Fellowship Awards..

We believe a major benefit of a Environmental Research Specialization will be to enlarge the reach of development by showing prospective donors that our fusion of natural sciences, humanities, and social science is aimed at finding solutions to environmental problems. This has clearly been the experience of our major competitors, all of whom have managed multimillion-dollar gifts to establish and develop their interdisciplinary environmental graduate programs.

A. Introduction

A1. Aims and Objectives

This is a coordinated proposal for a new interdisciplinary graduate specialization: the Program for Interdisciplinary Environmental Research (PIER) with the aim of providing graduate students from a variety of existing graduate programs the opportunity to specialize in research and training on the biological, physical, economic, social, arts and humanities aspects of environmental research, conservation, and sustainability. Our aim is to formalize the training program initiated by the NSF-funded Integrated Graduate Education and Research Training (IGERT 2003-2013) and its successor, the informal PIER track, that provides a broad and interdisciplinary approach—spanning the social and natural science—and focuses on solutions to global environmental issues. This specialization is not a stand-alone program since students will still receive their degrees through their home departments—SIO, Anthropology, Biology, Economics, Political Science, Sociology, Rady, GPS, Philosophy, and Chemistry with PIER as an interdisciplinary *specialization*. PIER aims to provide graduate students who have just embarked on their graduate careers with the opportunity to interact and communicate with peers in different disciplines throughout the duration of their Ph.D. work. Such communication across disciplines from the outset is key to fostering a capacity for interdisciplinary “language” skills and conceptual flexibility.

A2. Historical Background

A multidisciplinary scientific research and training program has been underway since 2003 coordinated by the Center for Marine Biodiversity and Conservation at Scripps Institution of Oceanography/UCSD. Our experience convinces us that an interdisciplinary curriculum is needed to equip the next generation of scholars who will formulate and address questions concerning the sustainability of the earth and ocean environments. Under IGERT, we developed a ten-week interdisciplinary summer course, an Interdisciplinary Forum, a series of Science-Law-and-Policy courses, a Marine Law Class, and program elements including an internship and Group research project. These courses have largely been maintained and funded by the Masters of Advanced Study in Marine Biodiversity and Conservation (MAS-MBC). We have also developed donor support and San Diego Fellowships to fund full year stipends and fees for eight Ph.D. students (since 2013). The positive student career paths and the value of the program for cementing interdisciplinary research activities across campus has motivated us to convert this program into a larger and more publicly active program.

A3. Rationale for New Specialization

The oceans face a growing list of threats to their integrity, productivity, and biodiversity from pollution and eutrophication, overfishing, species invasion, climate change including warming, acidification, deoxygenation and sea level rise, energy and minerals exploitation. The ultimate drivers for most of these threats are related to human resource demands and activities. Therefore, solutions to environmental issues will require not only understanding natural systems but also the human institutions and behavior geared toward marine conservation. Definitive answers require approaches in the biological, social and biomedical sciences, as well as aspects of the arts and humanities, with important technological input from the physical, chemical, and computing sciences.

Research in marine conservation and biodiversity also has a major impact on, and relevance for, many practical issues related to medicine, biology, organization of society, and the interactions of humans with one another and with our environment. The time has finally come to approach this topic in a systematic and interdisciplinary manner, and integrate the vast amount of relevant information emanating from many disciplines. It is evident that natural science alone cannot provide environmental solutions and that economic, societal and political issues often take precedence in decision-making.

The National Science Foundation has recognized this need with their broad-reaching NSF Research Traineeship (NRT) program. *NRT is designed to encourage the development of bold, new, potentially transformative, and scalable models for STEM graduate training that ensure that graduate students develop the skills, knowledge, and competencies needed to pursue a range of research and research-related careers within and outside academe. The NRT program is distinguished from the previous NSF training programs through an emphasis on training for multiple career pathways, rotating priority research themes, inclusion of both master's and doctoral students, a broader definition of trainees, and greater budgetary and programmatic flexibility. In addition, NRT is designed to promote the development and broad-scale adoption of highly effective STEM graduate education models that are suitable for the 21st century STEM enterprise. Goals of the NRT program are to:*

- *Catalyze and advance cutting-edge interdisciplinary research in high priority areas,*
- *Prepare STEM graduate students more effectively for successful careers within or outside academe, and*
- *Develop models and knowledge that will promote transformative improvements in graduate education.*

A4. Relationship to existing programs at UCSD

Collaboration with various ORUs and Centers across campus will add both depth and breadth of training available to students embarking on this specialization. As research in these centers evolves, the specialization provides a means to provide new research findings to students and training in new research techniques. This educational value added to the ORUs can be done through course work in the specialization and through student organized research symposia. Relevant programs and centers include:

Center for Marine Biodiversity and Conservation (CMBC)

CMBC is the intellectual home for PIER with research programs addressing the Gulf of California fisheries, the California Current and coastal environments, Central Pacific Atolls, Deep-Ocean Stewardship, Ocean Acidification, Marine Contaminants and Ocean Food Security.

Sustainable Production of Food and Fuel in the 21st Century (SPF2-21)

A number of our faculty participants are also participants in the SPF2-21 ORU.

UC Institute on Global Conflict and Cooperation (IGCC)

UCSD is host to IGCC, which facilitates collaborative research across the UC campuses. Joshua Graff Zivin is the research director for environmental issues at the Institute, leading several climate-change related projects. His participation in CMBC programs since his arrival at UCSD and his understanding of global issues makes IGCC an important partner.

UC Institute for International, Comparative and Area Studies (IICAS)

IICAS supports and encourages collaborative international research in areas such as economic and social development; international security and globalization. There are synergies between PIER interests and IICAS efforts.

Center on Global Justice (CGJ)

Graduate students associated with the CGJ and involved with the Critical Ecologies Research Forum are collaborating on the Interdisciplinary Forum for Environmental Change (see section B3)

CUSMS - Center for U.S. Mexican Studies (CUSMS)

Graduate students involved with the Interdisciplinary Forum for Environmental Change are collaborating with COLEF (El Colegio de la Frontera Norte) in Tijuana, devoting one meeting each quarter to cross border issues.

Center for Environmental Economics (CEE)

This center within UCSD's department of economics brings faculty and graduate students together for a weekly forum and sponsors graduate student research and travel, with special attention to interdisciplinary efforts.

Center for Sustainability Science, Planning and Design (SS-PAD)

SS-PAD brings diverse people and organizations together to collaboratively research and improve how neighborhoods, cities and regions function. The SS-PAD's integrative approach embraces two of UC San Diego's key strategic aims: (1) Understanding and Protecting the Planet, and (2) Understanding Cultures and Addressing Disparities in Society. The Center's mission is to sustainably cultivate equity, economic vitality, and environmental resilience through healthy placemaking—especially where harsh realities of poverty, environmental degradation, racism, inadequate infrastructure, unemployment and ill health are major sources of concern.

The US-Israel Center on Innovation and Economic Sustainability brings together academics, industry leaders, entrepreneurs and community supporters from around the world to work collaboratively on issues of innovation and growth. These connections foster discourse on both how to innovate and how to translate innovation into economic sustainability.

A5. Relationship to existing programs at other institutions

UCSD is now emphasizing interdisciplinary activities through vehicles such as the Understanding Nature and Protecting the Planet initiative, The Chancellor's "Collaboratories", and the "Frontiers of Innovation" funding mechanism. However, currently these efforts are piecemeal, mostly relying on relationships between small groups of faculty, and have yet to provide strong leadership in the integration of biological sciences, social sciences and humanities. This places UCSD at a disadvantage relative to our competitors such as Stanford, Arizona State University, Duke University, and the UCSB Bren School. Creation of the PIER specialization will demonstrate UCSD's commitment to interdisciplinary approaches to funding agencies, foundations, and private donors.

UCSB's Bren School of Environmental Science & Management offers an academic program for a specialization in Coastal Marine Resource Management. They integrate science, management, law, economics, and policy as part of an interdisciplinary approach to environmental problem solving. The program, in association with UCSB's National Center for Ecological Analysis and Synthesis, addresses marine ecology and conservation with research spanning from coast to ocean ecosystems. NCEAS, as the research arm of the Bren School, has an emphasis on sustainable fisheries, conservation & resource management, disease ecology, marine ecology, climate change, economics & ecology. PIER faculty collaborate with NCEAS researchers.

The Center for Ocean Solutions (COS) at Stanford University was established in 2007 with major funding from the David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation providing a core staff of nine augmented by graduate students and post docs. The research focus is on California Marine Spatial Planning (MSP), ecosystem health (coastal systems) including land-sea interactions and social-ecological systems for fisheries management and climate adaptation. Stanford's Emmett Interdisciplinary Program in Environment and Resources (E-IPER) fellowship program is endowed by a \$10 million gift from the Emmett Foundation.

Arizona State University-Global Institute of Sustainability received a \$27.5 M gift from the Walton Family Foundation to develop and deploy promising solutions to sustainability challenges including energy, water, environment, climate, social transformation and decision-making in local, national and global contexts, and to educate future leaders in sustainability. ASU has a long history of marine and policy research in the Gulf of California, Mexico and collaborate with PIER researchers.

A6. Program Administration

To minimize unnecessary bureaucracy, the PIER Specialization will be monitored and administered within each participating graduate program and coordinated through the Executive Committee.

The Executive Committee will include 6-8 participating faculty representing the various departments together with two co-directors. To ensure the program remains interdisciplinary, dynamic and representative of a wide range of interest of faculty at UCSD, the co-directors will be from different academic departments. A program administrator will work with the Executive Committee and the Directors in the management of the specialization, including admission, curriculum development and program evaluation. Membership on the Executive Committee will be adjusted regularly to reflect the recruitment of new faculty and also the level of faculty participation in teaching and other activities.

PIER Specialization Directors

Norris, Richard	SIO/Geoscience
Watson, Joel	Economics

PIER Specialization Steering Committee

Geoff Braswell	Anthropology
Craig Callender	Humanities/Philosophy/Ethics
Ayalet Gneezy	Rady School of Management
Josh Graff Zivin	GPS/IGCC
Mark Jacobsen	Economics
Lisa Levin	Director, CMBC
Sarah McCullough	Center for Humanities
Keith Pezzoli	Communication
Stuart Sandin	SIO/MBRD
Jon Shurin	Biology

To reflect involvement of the students in the cultural and academic development of the program, student representatives will serve on the steering committee in an ex-officio capacity .

Admissions Committee:

Each year the Steering Committee will choose a faculty member from each participating department to serve on the Admissions Committee. The Steering Committee will ensure that this service work is shared equally among the participating faculty. Admission into the specialization requires that the students have already been admitted to their home department. In the event that incoming students are also admitted to PIER, the assigned faculty representative for a department will need to work closely with the admissions committee of the respective home department. The Admissions Committee will evaluate and rank the pool of applicants for admission into the specialization. Ordinarily, this admission meeting will occur in the early winter at the time that Ph.D. candidates are being evaluated for admission to the university.

Academic Committee:

Each year the Steering Committee will choose a faculty member from each participating department to serve on the Academic Committee. This committee will evaluate and coordinate the courses, oversee the streamlining of existing courses and the development of new courses, and make decisions on student performance and petition when special situations arise.

A7. Evaluation plan

An annual internal review by the Executive Committee will evaluate student participation and performance, as well as faculty participation and departmental support. Based on this evaluation and on available funding mechanisms, adjustments will be made to the specialization.

B. Program

B1. Overview

PIER provides a broad and interdisciplinary approach—spanning the social and natural sciences as well as the arts and humanities—and focusing on solutions to global environmental issues. This specialization is not a stand-alone program since it draws on students who have been admitted to, and continue to work extensively within their home departments. PIER provides graduate students with the opportunity to interact and communicate with peers in different disciplines throughout the duration of their PhD projects. Such communication across disciplines from the outset is key to fostering a capacity for interdisciplinary “language” skills and conceptual flexibility.

The broad research topic areas may include: • Economics and the Environment • Environmental Policy and Law • Climate Science and Adaptation • Environmental Ethics • Marine Biodiversity and Conservation • Historic Environmental Response • Culture and Environment • Human Behavior and the Environment • Environmental Toxins & Human Health • National Security and the Environment.

PIER is designed to become a Specialized Track in Interdisciplinary Environmental Research in the following departments with these degree titles:

Anthropology

Ph.D. in Anthropology with a Specialization in Interdisciplinary Environmental Research

Biology

Ph.D. in Biological Sciences with a Specialization in Interdisciplinary Environmental Research

Chemistry

Ph.D. in Chemistry with a Specialization in Interdisciplinary Environmental Research

Economics

Ph.D. in Economics with a Specialization in Interdisciplinary Environmental Research

Global Policy and Strategy

Ph.D. in Political Science and International Affairs with a Specialization in Interdisciplinary Environmental Research

Philosophy

Ph.D. in Philosophy with a Specialization in Interdisciplinary Environmental Research

Political Science

Ph.D. Political Science with a Specialization in Interdisciplinary Environmental Research

Ph.D. Political Science and International Affairs with a Specialization in Interdisciplinary Environmental Research

Rady School of Management

Ph.D. in Management with a Specialization in Interdisciplinary Environmental Research

Scripps Institution of Oceanography

Ph.D. in Earth Science with a Specialization in Interdisciplinary Environmental Research

Ph.D. in Oceanography with a Specialization in Interdisciplinary Environmental Research

Ph.D. in Marine Biology with a Specialization in Interdisciplinary Environmental Research

Sociology

Specialization Track Recommendations

Anthropology: It is advised that students begin their PIER coursework in their 3rd year

Biology: It is advised that students begin their PIER coursework in their 2nd year

Chemistry: It is advised that students begin their PIER coursework in their 3rd year

Economics: It is advised that students begin their PIER coursework in their 3rd year

GPS: It is advised that students begin their PIER coursework in their 2nd year

Philosophy: It is advised that students begin their PIER coursework in their 3rd year

Political Science: It is advised that students begin their PIER coursework in their 3rd year

Rady: It is advised that students begin their PIER coursework in their 3rd year

SIO: It is advised that students begin their PIER coursework in their 1st year

Sociology: It is advised that students begin their PIER coursework in their 3rd year

B2. Admission Requirements

All Ph.D. students will be admitted through one of the participating home departments.

Participating graduate programs will nominate candidates (graduate applicants and incoming candidates) based on the candidates' academic background and interest in environmental solutions and interdisciplinary study. Admission is expected to be a competitive process, with 6-8 slots granted each year from across all participating UCSD graduate programs. The number of students admitted annually to PIER is set by the expected enrollment in our flagship summer course "*SI0295S/295LS (16 units) Global Change, Marine Ecosystems and Society*" and availability of summer funding. Selection will be based on the student's academic record and fit to the goals of the PIER Specialization and may be evaluated based upon a written file, statement of interest, and oral presentation. The program will attempt to raise funds through cross-campus donors and grants to support one year of stipend, tuition and fees and a paid internship for each student, but enrollment in PIER is not dependent upon identified funding from the Specialization Program.

- Candidates to UCSD should note their interest in the PIER training program in their statement of purpose and submit a separate PIER essay no later than the graduate department application deadline. The PIER essay should expand on the applicant's personal and research goals and describe how they will benefit from the interdisciplinary training.
- Current Ph.D. Students must submit an essay of interest and a letter of support from their faculty advisor. The faculty support letter should expand on the student's academic abilities to succeed in the program and include a commitment of summer stipend support. These materials are due the last day of February.
- Students must work with their "home" graduate coordinate to complete a general petition adding the major codes to the PIER Specialization Ph.D.

B3. Program of study

As detailed below, the PIER Specialization consists of a 16-unit required summer course, a minimum of 8 units from a secondary field (outside the student's home department) and 6 units from the environmental research forum. Ph.D. students must also complete all course work, a dissertation, and the other requirements of their home program. It is expected that at least one chapter of the dissertation will be broadly related to environmental research and will be interdisciplinary in nature. We expect this comprehensive program to take no more than one extra quarter to complete compared to the duration of the standard Ph.D. program offered by the home departments.

PIER Specialization Requirements:

(a) SIO295S/295LS (16 units – Summer only) Global Change, Marine Ecosystems and Society.

The course provides students with an introduction to multiple relevant fields of study in order to help students with diverse educational backgrounds establish a fundamental skill set and common language. The course demonstrates the linkages among various disciplines and the need for interdisciplinary approaches to address environmental challenges. Upon completion all students will have a basic understanding of marine biodiversity, conservation, and global change through the lenses of biological science, economics, business, governance, and ethics. Students will also develop key communication skills. Students in the Scripps Institution of Oceanography Master of Advanced Studies in Marine Biodiversity and Conservation program (MAS-MBC) also participate in this course, giving MAS and PhD students the opportunity to collaborate on interdisciplinary projects.

SIO295S/SIO295LS was designed to develop an exchange of ideas and experience between the professional MAS students who have been in the workforce and the academic Ph.D. students. In addition to the value added from this exchange, the 1-year MAS students are more quickly engaged in the university system, better able to find mentors when needed, and succeed at the higher academic level the program requires. MAS-MBC admissions are capped at 20 students and the class can accommodate up to 30 students. Typically 30-40 instructors participate in this highly interdisciplinary course. We have had as many as 26 students (20 MAS and 6 Ph.D.) in the class to date without impact on instruction or faculty-student contact.

(b) SIO 296 [permanent course number requested] (2 units) Interdisciplinary Forum on Environmental Research (IFER).

IFER is a bi-weekly, student led lecture and discussion series intended to foster a sense of community and help develop interdisciplinary collaboration and communication between students across campus. The forum is a collaboration between Scripps Institution of Oceanography's Center for Marine Biodiversity and Conservation, the Arts & Humanities Department's Critical Ecologies Research Forum, and El Colegio de la Frontera Norte (COLEF) in Tijuana. Faculty oversight rotates through participating PIER faculty members. Each PIER cohort is responsible for organizing all aspects of topic selection, planning, scheduling, and promotion of forum events with a summary of activities at the end of each quarter for 3 quarters. The students select a quarterly theme of broad interest. Some examples include: "Climate Change Policy and the Oceans", "Environmentalism in the Developing World", "Strategies for Preserving Biodiversity", "Animal, Plant and Biodiversity Ethics", "Beyond The Anthropocene: Mitigation vs Adaptation", "Interface of and Appropriate Roles for Science and Policy", "Natural Ethics and Activism for Warmer Times", "Role of Individual in Community and Nature", "Adaptation, Geoengineering, and Resilience", "Scientific Doubt, Lifestyle, and Technology", "Food, Agriculture, and Trade", "The Use and Abuse of Catastrophic Rhetoric", and "Artisanal Fisheries and Conservation of Marine Biodiversity". See Appendix E4 IFER events.

(c) Secondary Field Coursework. Each student is required to complete two or more courses in a single discipline other than those in the student's primary department—called the *secondary field*—that are chosen by the student and approved by the student's "secondary thesis advisor" (see below). This requirement is satisfied by enrolling, and obtaining a grade of at least "B–" or PASS, in the selected courses, which may constitute a sequence or a selection of core or elective courses. The student's secondary thesis advisor must approve that the selected courses satisfy the secondary field requirement. The courses may be taken before the student's secondary thesis advisor has been identified, but the secondary thesis advisor must certify that the courses taken shall satisfy the requirement. See Appendix E3 Course List.

B4. Program opportunities and other requirements

Group Research: The PIER Program requires each cohort to engage in "group research"—typically

three or more students from a mixture of different disciplines working collaboratively on a common problem. The output of this interaction may be: (1) a contribution to the interdisciplinary component of the students' dissertations; (2) an interdisciplinary position paper (such as a policy white paper, printed flyer or web pages); (3) a publishable technical paper; or (4) development of a conference and the resulting proceedings. The requirement could also be satisfied with an art show, film or other creative product that illustrates an interdisciplinary theme. Students will submit brief proposals to the Academic Committee for review and considerations of funding options. Students must identify a faculty advisor who will work with them to develop the group study. In most cases, this academic advisor is expected to run a seminar devoted to the group project to provide structure and limit the scope of the group project. *Examples are in Appendix E5.*

Internships (when funding is available): Participation in an Internship with a domestic or international partner, outside of academia, can broaden the tools and experience that a student brings to his/her dissertation work and expand beyond the core discipline. The objective is to introduce students to topics and organizations that they would be unlikely to encounter without the aid of an organized internship. Internships will typically involve several weeks of work with a partner organization that expands the scope of the student's research. Examples include introducing the student to a novel aspect of research, gaining insights from policymakers, exploring the implications of thesis work, and providing information about alternative career paths. Internship opportunities may be identified by students or participating faculty members. *Examples are provided in Appendix E6.*

Doctoral Committee: Constitution of the Doctoral Committee will be enforced in accordance with University and home department regulations. At least one member of the Committee will be the "Secondary Thesis Advisor" representing a PIER-affiliated department in the students' "secondary" field of study. The other committee members are selected by the student and the primary advisor to represent the intellectual breadth of the student's thesis work and will normally draw heavily from the students' home department.

Student reporting requirements: To provide data for program evaluation and train students for future grant reporting, PIER students will provide an Annual Summary of Activities including:

- Publications (full citations)
- Conference Presentations (Name and date of conference and title of publication, poster or presentation).
- Teaching activities.
- Outreach activities (includes Op-Eds, TV, Radio, newspaper & public or school presentations).
- Highlights or discoveries from research activities.

C. Faculty

C1. Number of Faculty to Serve

Thanks to the NSF funded IGERT program (2003-2013) and CMBC affiliated members, we have the intellectual infrastructure and a dedicated, critical mass of faculty necessary to serve this program. Please see Appendix E1 for a complete list of members.

C2. Interdisciplinary Faculty group

Steering Committee

Richard Norris is the Academic Chair for the *Center for Marine Biodiversity and Conservation and Distinguished Professor of Geoscience at SIO*. His research involves: (1) the processes that initiate

large-scale evolutionary trends including the aftermath of mass extinctions, (2) the role of environmental change in structuring the biogeography and diversity of species, and (3) the role of humans in modification of ocean habitats. He is author or co-author of more than 115 scientific publications and 5 books. He has served as chair of the NRC panel on “Deep Time”, expedition leader of two International Ocean Discovery Program research cruises, and Chair of the International Science Support Office for the Ocean Discovery Program. At UCSD, he has contributed served on the Sustainability Solutions Initiative and the Environmental Solutions Institute as well as the campus Education Initiative. Norris has his B.S. from UCSC, MS from U. Arizona, and Ph.D. from Harvard’s Museum of Comparative Zoology.

Norris served as PI and Director of the Marine Biodiversity and Conservation IGERT program (2007-2009) and PI and Director of Global Change, Marine Ecosystems and Society IGERT project (2009-2013). He also serves as Chair of SIO’s Master of Advanced Studies in Marine Biodiversity and Conservation, a self-supporting program that has trained and placed students across the globe in positions of influence. He is a regular instructor for the PIER Summer course, the IFER Forum, and the MAS Forum as well serving as faculty chair for the student group project “National Security and Climate Change”.

Joel Watson is a Professor in the *Economics Department* at the University of California, San Diego. His research mainly addresses how contractual relationships are formed and managed, as well as the role that institutions play in enforcing contracts, using game-theoretic models. Watson’s work addresses topics in a variety of applied areas, including law and economics, macroeconomics, labor economics, international economics, and environmental economics. He has authored numerous technical papers and a popular textbook on game theory (*Strategy: An Introduction to Game Theory*). Watson obtained his B.A. degree from UCSD and his Ph.D. from Stanford’s Graduate School of Business.

Watson has extensive experience in administration, instruction, and professional service. As Chairperson of the Economics Department from 2006 until 2008, he managed about 70 faculty, staff, and lecturers, and he oversaw some of UCSD’s most popular undergraduate major programs. Earlier, Watson served as the chair of UCSD’s Campus and Community Planning Committee. He served as Co-PI on the NSF IGERT grant “Global Change, Marine Ecosystems, and Society,” (2009 - 2013). Watson was given the Economics Department Award for Excellence in Undergraduate Instruction in 2010.

Geoff Braswell, Associate Professor of *Anthropology*

Braswell is interested in the ancient Maya and complex societies of highland Mexico and lower Central America; the emergence of complex society and economic systems, alternative models of social and political systems; geoarchaeology, geochemistry, lithic studies, mathematical methods, settlement pattern studies.

Craig Callender, Professor, *Philosophy*

Callender is Professor and Chair of the Department of Philosophy at UC San Diego. He is a philosopher of science specializing in the foundations of physics. He has published in philosophy, physics and law journals, and is the author of the forthcoming *What Makes Time Special?* (OUP, 2016). He is also committed to science outreach, publishing a popular graphic text (*Introducing Time*, Totem, 2000) as well as articles in *Scientific American*, the *New York Times*, and elsewhere. On the side, he has a serious interest in environmental ethics, having taught it for more than twenty years. His courses include PHIL 148 Philosophy & the Environment, graduate seminars such as PHIL 245, and CMBC’s SIO295S/SIO295LS. Recently, he has become interested in psychology and the environment and will soon propose a study connecting life activities and values of adolescents with an index of environmental concern.

Ayelet Gneezy leads the Behavioral Research program. She is Assistant Professor of Marketing at *Rady School of Management*. Gneezy is interested in how consumers make sense of advertising and marketing practices and particularly in the ironic effects that are driven by consumers' distrust in firms. Gneezy applies her research to areas such as pricing, sustainability ad judgment and decision-making. She is also interested in exploring ways to drive consumers to behave in a more sustainable manner and examining the factors that influence an individual's decision to engage in charitable giving. Gneezy is a member of the Association for Consumer Research, the Society of Consumer Psychology and the Society for Judgment and Decision Making.

Joshua Graff Zivin, PhD is an Associate Professor School of Global Policy and Society and affiliated faculty of Economics. He is also a Research Associate at the National Bureau of Economic Research (NBER) and Research Director for International Environmental and Health Studies at the Institute for Global Conflict and Cooperation (IGCC) which facilitates collaborative research across the UC campuses. Joshua Graff Zivin is the research director for environmental issues at the Institute, leading several climate-change related projects. In 2004-2005, he served as Senior Economist for Health and the Environment on the White House Council of Economic Advisers. Prior to joining UCSD, he served as the Director of the interdisciplinary PhD Program in Sustainable Development at Columbia University. Prior to joining UCSD in 2008, he was an Associate Professor of Economics in the Mailman School of Public Health and the School of International and Public Affairs at Columbia University, where he served as the Director of the PhD Program in Sustainable Development. Professor Graff Zivin's areas of expertise include the economics of technological innovation and environmental decision making under uncertainty.

Mark Jacobsen - Economics

Mark Jacobsen is an associate professor in the department of economics and a research associate at the National Bureau of Economic Research. He received his Ph.D. in economics from Stanford University. Jacobsen's research focuses on environmental regulation and taxes and addresses two main themes: the first is regulation of gasoline and energy use in transportation and the automobile industry. The second examines the way that environmental and energy taxes, for example carbon taxes, fit into and interact with the broader tax system.

Lisa Levin - SIO

Lisa leads the Deep-Ocean Stewardship Initiative. She is the current Director of CMBC and Distinguished Professor at the Scripps Institution of Oceanography in La Jolla, California. Dr. Levin is a marine ecologist who has authored over 200 papers on benthic ecosystems in the deep sea and shallow water. Together with her students Dr. Levin has worked with a broad range of taxa, from microbes and microalgae to invertebrates and fishes. Her recent research has emphasized several major themes: (1) the structure, function and vulnerability of continental margin ecosystems, particularly those subject to climate change and human exploitation; (2) the design and use of natural treatment systems to enhance stormwater contaminant removal and infiltration; and (3) the interactive effects of ocean deoxygenation and ocean acidification on marine species and assemblages. She also studies wetland interactions as they mediate marsh function, invasion and restoration; and larval connectivity of coastal marine populations. Dr. Levin's deep-sea research has been conducted over the past 3 decades on the margins of the Pacific, Indian and Atlantic Oceans using ships, submersibles, remotely operated vehicles (ROVs) and telepresence to sample and conduct experiments.

Sarah McCullough - UCSD Center for Humanities

Sarah Rebollosa McCullough, PhD, works as the Associate Director of the *Center for the Humanities* at UC San Diego. She creates meaningful and respectful dialogue across boundaries that typically divide—between universities and communities, activists and researchers, scientists and humanists, workers and policymakers. She conducts applied research on cultural adaptations to climate

change with a focus on sustainable transportation through the Bicultures project.

Keith Pezzoli - Communication

Keith Pezzoli is a Professor of Teaching in UC San Diego's Department of Communication. He also Directs the Urban Studies and Planning Program, and the *Center for Sustainability Science, Planning and Design* (SS-PAD). His research and teaching focuses on the intersection of health, ecology and planning in cities and regions around the world. He is currently engaged in collaborative projects examining the food-water-climate trilemma, integrated regional watershed management, urban-ecological restoration in the U.S.-Mexico border region, and urban agriculture and food disparities (a UC Global Food Initiative). Courses he teaches include Sustainable Development, Politics of the Environment, Urban World System, and Field Research Methods.

Dr. Stuart Sandin - SIO

Stuart leads the Central Pacific Atolls Research for CMBC. He is a quantitative ecologist with specific interests in the population and community ecology. His research addresses questions in which ecology can most effectively inform marine management. What have been the impacts of human activities on marine ecosystems? How have changes in the structure of these ecosystems affected their functioning, especially related to important ecosystem services? Finally, how can ecological insights best be applied to develop creative and effective solutions to marine management problems? Much in the same way that an engineer provides informed solutions to practical commercial problems, an ecologist can provide informed recommendations for the protection and sustained use of natural resources. His research focuses largely on the ecology of coral reefs, with the goal of finding effective management and restoration approaches for this imperiled ecosystem.

John Shurin, UCSD Biology, studies the control of diversity and productivity in marine and freshwater ecosystems by climate, predators and resources. His work takes him to alpine lakes in the Sierra Nevada mountains of California and the Sierra Madre of Colombia as well as kelp forests in the Pacific. His research asks how the environment affects the quantity and quality of freshwater resources, and how organisms and ecosystems vary along natural climatic gradients associated with latitude or elevation.

Resource Requirements

This program is poised to be the catalyst for positive institutional change. Our model seamlessly integrates efforts across disciplines at UCSD and both compliments and adds concretely to campus initiatives such as "Understanding Nature and Protecting the Planet", "Enriching Human Life and Society" and "Understanding Cultures and Addressing Disparities in Society." *We believe a major benefit of a Environmental Research Specialization will be to enlarge the reach of development by showing prospective donors that our fusion of natural sciences, humanities, and social science is aimed at finding solutions to environmental problems.* This has clearly been the experience of our major competitors at Stanford, UCSB and Arizona State, all of whom have managed multimillion-dollar gifts to establish and develop their interdisciplinary environmental programs.

D. 1 Graduate Student Support

PIER is not intended to be a funding mechanism but an acknowledgement of a student's breadth of interdisciplinary training. The program is designed for motivated students to successfully complete all elements during one's tenure as a Ph.D. student without extending the time to degree. Additional support (beyond summer) is therefore not necessary for participating students.

All Ph.D. students will be admitted through one of the participating home departments.. Each participating department or faculty advisor, as a commitment to the program, will provide summer stipend support for their student. These can be donor funds, department funds or faculty funds. PIER

will provide summer fees for students admitted to the program. The program will help better connect our university to the world and we expect will open new lines of extra-mural support (similar to "Invent the future" graduate student support campaign) . To take advantage to the interest in solutions oriented training, the specialization will pursue funding from NSF training grants, donor support, and matching San Diego Fellowship Awards but these are not required to sustain the program. Funding for group projects may come from Chancellor's collaboratories and other funding mechanisms.

<i>PIER Requirements/opportunities/timeline</i>			
Typical SIO PIER Student		Typical Economics PIER Student	
Year 1 (Admitted to PIER year 1)	PIER Credits	Year 1	PIER Credits
<i>Summer PIER boot camp</i>	16 units	Home-department core requirements	
Home-department core requirements			
Year 2		Year 2	
<i>IFER Forum (F, W, S)</i>	6 units	Home-department core requirements	
Home-department core requirements			
Year 3		Year 3 (Admitted to PIER year 3)	
Thesis research & other department requirements		<i>Summer PIER boot camp</i>	16 units
<i>Secondary field coursework</i>	4 units	<i>IFER Forum (F, W, S)</i>	6 units
<i>Group research project</i>	Chancellors Collaboratories	Thesis research & other department requirements	
Year 4		Year 4	
Thesis research		Thesis research & other department requirements	
<i>Secondary field course work</i>	4 units	<i>Secondary field coursework</i>	4 units
<i>Summer internship</i>	When funding is available	<i>Group research project</i>	Chancellors Collaboratories
Year 5		Year 5	
Thesis research		Thesis research	
		<i>Secondary field course work</i>	4 units
		<i>Summer internship</i>	When funding is available
NOTES:			
1. Program entry varies in department (i.e. Economics & other departments require 2 years of core courses prior to PIER entry; SIO requires entry in year 1)			
2. PIER students will be held to the same departmental funding standards as all graduate students in the department			
3. Current PIER funding is through a mix of funds including research or training grants, San Diego Matching Fellowships, donors support, and Departments			
4. The PIER program pays the summer fees for PIER students, the department pays the PIER students stipend.			

E. Appendices

APPENDIX E1 - Faculty Participants

SC = Steering Committee

Name/Position	Department	Role	email
Richard D. Norris, Professor	SIO	Co-director	rnorris@ucsd.edu
Thomas Csordas, Professor	Anthropology		tcsordas@ucsd.edu
Geoffrey Braswell, Assoc. Professor	Anthropology	SC	gbraswell@ucsd.edu
David Pedersen, Associate Professor	Anthropology		dpedersen@ucsd.edu
David Holway, Professor	Biological Sciences		dholway@ucsd.edu
Elsa Cleland	Biological Sciences		ecleland@ucsd.edu
Jon Shurin, Professor	Biological Sciences	SC	jshurin@ucsd.edu
Eric Allen	Biological Sciences		eallen@ucsd.edu
Carol Kurle, Asst. Professor	Biological Sciences		ckurle@ucsd.edu
Pieter Dorrestein, Assoc. Professor	Chemistry		pdorrestein@ucsd.edu
Michael Cole, Professor Emeritus	Communication		mcole@ucsd.edu
Keith Pezzoli	Communication	SC	kpezzoli@ucsd.edu
Joel Watson Professor	Economics	Co-director	jwatson@ucsd.edu
Richard Carson, Professor	Economics		rcarson@ucsd.edu
Ted Groves, Prof Emeritus	Economics		tgroves@ucsd.edu
Mark Jacobsen, Asst. Professor	Economics		m3jacobsen@ucsd.edu
Dale Squires, Adjunct Professor	Economics, IR/PS		dale.squires@noaa.gov
Junjie Zhang, Assistant Professor	GPS		junjiezhang@ucsd.edu
David Victor, Professor	GPS		dgvector@ucsd.edu
Josh Graff-Zivin, Associate Professor	GPS	SC	jgraffzivin@ucsd.edu
Sarah McCullough, Assoc. Director	Center for Humanities/Poli Sci	SC	smcc@ucsd.edu
James Fowler, Professor	Political Science		jhfowler@ucsd.edu
Craig Callender, Professor	Philosophy	SC	ccallender@ucsd.edu
Clark Gibson, Professor	Political Science		ccgibson@ucsd.edu
Thad Kousser, Assoc Professor	Political Science		tkousser@ucsd.edu
Steven Erie, Professor	Political Science		serie@ucsd.edu
David Lake, Professor	Political Science		dlake@ucsd.edu
Wayne Cornelius	Political Science		wcorneli@ucsd.edu
David A. Schkade, Professor	RadySchool		dschkade@ucsd.edu
Ayelet Gneezy, Asst. Professor	Rady School	SC	agneezy@ucsd.edu
Uri Gneezy, Professor	Rady School		ugneezy@ucsd.edu
Vish Krishnan	Rady School		vkrishnan@ucsd.edu
Octavio Aburto, Assist. Professor	SIO		maburto@ucsd.edu
Andreas Andersson, Assist. Professor	SIO		aandersson@ucsd.edu
Lisa Ballance, Adjunct Professor	SIO/NOAA		lisa.ballance@noaa.gov
Jay Barlow, Adjunct Professor	SIO/NOAA		Jay.barlow@noaa.gov
Ron Burton	SIO		rburton@ucsd.edu
David Checkley, Professor	SIO		dcheckley@ucsd.edu
Gerald D'Spain	SIO		gdspain@ucsd.edu
Peter Franks, Professor	SIO		pfranks@ucsd.edu
Sarah Giddings	SIO		sgiddings@ucsd.edu
Phil Hastings, Professor	SIO		phastings@ucsd.edu
Amro Hamdoun, Asst. Professor	SIO		ahamdoun@ucsd.edu
Mark Hildebrand, Professor	SIO		jahildebrand@ucsd.edu
Ralph Keeling, Professor	SIO		rkeeling@ucsd.edu
Charlie Kennel, Professor	SIO, CASPO		ckennel@ucsd.edu
Tony Koslow, Researcher	SIO		jkoslow@ucsd.edu
Jim Leichter, Assoc Professor	SIO		jleichter@ucsd.edu
Lisa A. Levin, Professor	SIO, IOD	SC	llevin@ucsd.edu
Art Miller, Professor	SIO		amiller@ucsd.edu
Greg Mitchell, Research Biologist	SIO-IOD		gmitchell@ucsd.edu
Joel Norris	SIO		jnorris@ucsd.edu
Mark Ohman, Professor	SIO-IOD		mohman@ucsd.edu
Ed Parnell, Assoc. Researcher	SIO		eparnell@ucsd.edu
Greg Rouse, Professor	SIO		grouse@ucsd.edu
Stuart Sandin, Asst. Professor	SIO	SC	ssandin@ucsd.edu
Brice Semmens, Asst. Professor	SIO		bsemmens@ucsd.edu
Jennifer Smith, Asst. Professor	SIO		jes013@ucsd.edu
George Sugihara	SIO		gsugihara@ucsd.edu
Jennifer Taylor, Assist. Professor	SIO		j3taylor@ucsd.edu
Martin Tresguerres, Asst. Professor	SIO		mtresguerres@ucsd.edu
Jeff Severinghaus, Professor	SIO, Geoscience		jseveringhaus@ucsd.edu
Ivan Evans, Professor	Sociology		ievans@ucsd.edu
John Evans, Professor	Sociology		jevans@ucsd.edu
Gershon Shafir, Professor	Sociology - IICAS		gshafir@ucsd.edu
Jeff Haydu	Sociology		jhaydu@ucsd.edu



DEPARTMENT OF ANTHROPOLOGY
9500 GILMAN DRIVE
FAX: (619) 534-5946
LA JOLLA, CALIFORNIA 92093-0532

October 23, 2015

Dear Graduate Council,

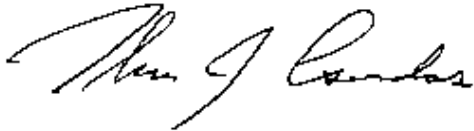
I am writing to express strong support for the Program for Interdisciplinary Environmental Research (PIER) proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including Anthropology as well as our numerous partners in industry, government and non-governmental organization. This will help us to better connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

Having department faculty who have served on IGERT and CMBC committees reinforces our commitment to supporting this interdisciplinary approach. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas J. Csordas". The signature is fluid and cursive, with the first name "Thomas" and last name "Csordas" being clearly legible despite the stylized script.

Thomas J. Csordas, Ph.D.
Dr. James Y. Chan Presidential Chair in Global Health
Professor and Chair of Anthropology
Founding Director, Global Health Program
Associate Director, UCSD Global Health Institute



WILLIAM J. MCGINNIS, Ph.D.
Dean & Professor, Cell & Developmental Biology
Division of Biological Sciences

9500 Gilman Dr.
La Jolla, CA 92093-0349
Phone: (858) 822-5738
Fax: (858) 822-0460
E-mail: wmcginnis@ucsd.edu

December 14, 2015

TO: Graduate Council

FROM: Bill McGinnis
Dean, Division of Biological Sciences

SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D. Specialization Program.

I am writing to express support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Ph.D. in Biological Sciences, with a Specialization in Interdisciplinary Environmental Research. The Biological Science's Section of Ecology, Behavior and Evolution (EBE) views PIER as a important addition to the choices for cross-disciplinary graduate education, and as Dean, I support this. We believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social, physical, and biological sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support EBE students who wish to complement the section's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including our EBE section, as well as our numerous partners in industry, government and non-governmental organization.

Jonathan Shurin currently participates on the PIER steering committee, and Eric Allen, Elsa Cleland, and David Holway are PIER faculty participants. This reinforces our commitment to this interdisciplinary approach. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink that reads "Bill".

William McGinnis, Dean

cc: Assistant Dean Bauer
Associate Dean Firtel, Ph.D.
Chair Nieh, Ph.D.
Professor Lykke-Andersen
Professor Shurin, Ph.D.



PARTHO GHOSH
PROFESSOR AND CHAIR
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY
UNIVERSITY OF CALIFORNIA, SAN DIEGO

9500 GILMAN DRIVE
LA JOLLA, CALIFORNIA 92093-0358
EMAIL: PGHOSH@UCSD.EDU
PGHOSH.UCSD.EDU

24 November 2015

Dear Members of the Graduate Council:

I am writing to express strong support from the Department of Chemistry & Biochemistry for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Chemistry with a Specialization in Interdisciplinary Environmental Research. My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education, and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including the Department of Chemistry & Biochemistry as well as our numerous partners in industry, government and non-governmental organization. This will help us to better connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely yours,

A handwritten signature in black ink, appearing to read "P. Ghosh", with a long horizontal stroke extending to the right.

Partho Ghosh,
Professor and Chair of Chemistry & Biochemistry



James E. Rauch, Chair
Department of Economics
econchair@ucsd.edu
(858) 534-1055
(858) 534-5592 (fax)

9500 Gilman Drive
La Jolla, California
92093-0508

To: Graduate Council
FROM: James E. Rauch, Chair, Economics
SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D. Specialization

I am writing to express strong support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Ph.D. Economics with a Specialization in Interdisciplinary Environmental Research. My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including Economics as well as our numerous partners in industry, government and non-governmental organizations. This will help us to better connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

Joel Watson, Mark Jacobsen, Richard Carson, and Ted Groves who have served on IGERT and CMBC committees reinforce our commitment to supporting this interdisciplinary approach. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in dark ink that reads "James E. Rauch". The signature is written in a cursive, flowing style.

James E. Rauch, Chair, Economics



PETER F. COWHEY
Dean, School of Global Policy and Strategy
Qualcomm Chair In Communications and Technology Policy

9500 Gilman Drive, 0519
La Jolla, California 92093-0519
T: (858) 534-1946
pcowhey@ucsd.edu
<http://gps.ucsd.edu>

October 28, 2015

To: Professor David Salmon, Chair
Graduate Council

Subject: Approval, PIER Ph.D. Specialization Program

I am writing to offer the strong support of the faculty of the School of Global Policy and Strategy for the Scripps Institution of Oceanography proposal to establish a Ph.D Specialization in Interdisciplinary Environmental Research. Under the leadership of Chancellor Khosla, UCSD has made a dual commitment to both facilitating the growth of research on “understanding and saving the planet” and the institutionalization of interdisciplinary collaboration. The proposal from Scripps is an important step in addressing the foundational insight of that initiative—that innovation will come more quickly and soundly by cutting across traditional departmental boundaries.

By institutionalizing training which Scripps has been doing since the NSF-funded Integrated Graduate Education and Research Training (IGERT 200302013), the campus will move from relying on relationships among groups of faculty to establishing a platform that brings the biological sciences, social sciences, and humanities into regular and directed collaboration. The best Ph.D. applicants in the individual disciplines will begin their programs already engaged with colleagues and faculty driven by the same intellectual problems.

Graduate Council is aware of the interest in interdisciplinary collaboration among both faculty and students. The success of the IGERT program as well as on-going partnerships between faculty, graduate researchers and off-campus entities are evidence of this. The School of Global Policy and Strategy was founded on that basis and is endeavoring to reach, as Scripps is, more broadly and widely. Indeed, we are impressed by the work of one of our faculty, Joshua Graff-Zivin, on the PIER proposal and his commitment to sit on the Specialization Steering Committee.

It is clear that PIER will enhance graduate education and, by extension, raise even further the visibility of UCSD as an educational model. We urge Council to approval this proposal.

Sincerely,

A handwritten signature in black ink, reading "Peter F. Cowhey".

Peter F. Cowhey
Dean, School of Global Policy and Strategy

October 19, 2015

To: Graduate Council

FROM: Micaela Smith, PhD
Interim Assistant Director, Center for the Humanities

SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D. Specialization Program.

I am writing to express strong support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Ph.D. Degree with a Specialization in Interdisciplinary Environmental Research. My Center views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including our Center as well as our numerous partners in industry, government and non-governmental organization. This will help us to better connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

Dr. Sarah McCullough, Associate Director for the Center for the Humanities, has worked with the PIER team in the integration of IFER as an interdisciplinary cross-campus forum discussed in the project proposal. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink, reading "Micaela Smith". The signature is fluid and cursive, with the first name "Micaela" written in a larger, more prominent script than the last name "Smith".

Micaela Smith, Ph.D.,

Interim Assistant Director, Center for the Humanities



858-822-1655 ccallender@ucsd.edu Philosophy Department, 9500 Gilman Drive, La Jolla, CA 92093-0119

October 8, 2015

To: Graduate Council
From: Craig Callender, Chair of Philosophy
Subject: PIER Ph.D. Specialization Program.

I am writing to express strong support for the proposed Ph.D. Specialization in Interdisciplinary Environmental Research and request the establishment of a new degree titled Ph.D. Philosophy with a Specialization in Interdisciplinary Environmental Research. My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UC San Diego is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, as well as humanities, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including Philosophy as well as our numerous partners in industry, government and non-governmental organization. This will help us to better connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

I've served on IGERT and CMBC committees and this experience reinforces my commitment to supporting this interdisciplinary approach. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink, appearing to read "Craig Callender", enclosed within a thin black rectangular border.

Craig Callender

Professor and Chair of Philosophy



ROBERT S. SULLIVAN
DEAN
STANLEY AND PAULINE FOSTER ENDOWED CHAIR
RADY SCHOOL OF MANAGEMENT

9500 GILMAN DRIVE 0553
LA JOLLA, CALIFORNIA 92093
EMAIL: rss@ucsd.edu
(858) 822-0830
URL: <http://rady.ucsd.edu>

October 15, 2015

TO: Graduate Council

FROM: Robert S. Sullivan
Dean, Rady School of Management

SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D. Specialization Program.

I am writing to express strong support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Doctor of Philosophy in Management with a Specialization in Interdisciplinary Environmental Research. My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including the Rady School of Management as well as our numerous partners in industry, government and non-governmental organization. This will help us to better connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

Ayelet Gneezy has served on IGERT and CMBC committees reinforces our commitment to supporting this interdisciplinary approach. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink, reading "Robert S. Sullivan". The signature is fluid and cursive, with the first name "Robert" and last name "Sullivan" clearly legible.

Robert S. Sullivan

Dean

Stanley and Pauline Foster Endowed Chair
Rady School of Management



SCRIPPS INSTITUTION OF OCEANOGRAPHY

9500 GILMAN DRIVE
LA JOLLA, CA 92093-0208

TO: Graduate Council
FROM: Brian Palenik
Chair, Scripps Institution of Oceanography
SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D.
Specialization Program.

I am writing to express strong support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Ph.D. with a Specialization in Interdisciplinary Environmental Research. My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. In my own department, a broad array of faculty with diverse interests have signed a memo of support for the approval of the PIER track. It is clear that PIER's creation will enhance graduate education at SIO and UCSD and I urge Graduate Council to approve the proposal to establish this specialization.

Sincerely yours,

A handwritten signature in cursive script, reading "Brian Palenik".

Brian Palenik
Professor, and Department Chair
Department of Scripps Institution of Oceanography



DEPARTMENT OF SOCIOLOGY

Main Phone: (858) 534-4627

Fax: (858) 534-4753

Akos Rona-Tas

Professor and Chair

9500 GILMAN DRIVE, 0533

LA JOLLA, CALIFORNIA 92093-0533

November 20, 2015

To: Graduate Council

FROM: Akos Rona-Tas

Chair, Department of Sociology

SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D.
Specialization Program.

I am writing to express strong support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research* and request the establishment of a new degree titled Ph.D. in Sociology with a Specialization in Interdisciplinary Environmental Research. My department views PIER as a vitally important addition to the choices for cross-disciplinary graduate education and we believe that UCSD is in a strong position to foster this solutions-oriented program and make it an internationally recognized educational model.

PIER is the successor to the successful NSF-IGERT sponsored interdisciplinary program and provides an excellent example of how scholarship and research can directly connect with important policy questions and projects in greater society. We agree that, in this critical time, we should focus on integrating perspectives and approaches across the social and physical sciences, in a broad effort to promote the tightly related objectives of human well-being and long-term stewardship of our environment. We therefore pledge to support students who wish to complement my department's Ph.D. program with the PIER specialization track. These students must fulfill the standard department requirements in addition to the PIER requirements.

PIER has broad appeal among students and faculty across campus from a wide range of disciplines. The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego including Sociology as well as our numerous partners in industry, government and non-governmental organization. This will help us to better

connect our university with the world and I look forward to seeking new lines of extra-mural support to sustain the program.

John Evans, Jeff Haydu, Ivan Evans and Gershon Shafir who have served on IGERT and CMBC committees reinforce our commitment to supporting this interdisciplinary approach. It is clear that PIER's creation will enhance graduate education at UCSD and we urge Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink, appearing to read 'Akos Rona-Tas' in a stylized, cursive script.

Akos Rona-Tas

Professor and Chair of Sociology



OFFICE OF THE DIVISIONAL DEAN – SOCIAL SCIENCES
OFFICE: (858) 534-6073
FAX: (858) 534-7394
Web: <http://socialsciences.ucsd.edu>

9500 GILMAN DRIVE
LA JOLLA, CALIFORNIA 92093-0502

November 2, 2015

To: Graduate Council

FROM: Carol Padden, Dean
Division of Social Sciences

SUBJECT: Program for Interdisciplinary Environmental Research (PIER) Ph.D. Specialization

I am writing to express my support for the proposed *Ph.D. Specialization in Interdisciplinary Environmental Research*. A number of departments in my division support the specialization as a unique opportunity for cross-disciplinary graduate education that capitalizes on current research directions.

The program provides an excellent opportunity for collaboration across divisions and schools at UC San Diego as well as our numerous partners in industry, government and non-governmental organization. This will help us to better connect our university with the world and I look forward to partnering with other Deans and unit heads on joint external funding.

I believe that PIER's creation will enhance graduate education at UCSD and I support their request to the Graduate Council to approve the proposal to establish this specialization.

Sincerely,

A handwritten signature in black ink, reading "Carol Padden", followed by a horizontal line.

Carol Padden
Berman Endowed Chair Professor, Department of Communication
and Center for Research in Language

Dean, Division of Social Sciences

Appendix E3. PIER Course List

Required Total 30 units:

SIO295S/295LS (16 units) Global Change, Marine Ecosystems, and Society

SIO296 (2 units x 3 = 6 units) Interdisciplinary Forum for Environmental Research

8 units Secondary field

Secondary field course options (2 courses from 1 field):

ANTHROPOLOGY

ANBI 114 Methods in Primate Conservation

ANBI 132 Conservation and the Human Predicament

ANBI 146 Stable Isotopes in Ecology

ANSC147 Global Health and the Environment

ANSC 160: Nature, Culture, and Environmentalism

BIOLOGICAL SCIENCES

BIBC140 Our Energy Future - Sustainable Energy Solutions

BIEB174 Ecosystems and Global Change

BIEB 176 Conservation and the Human Predicament

CHEMISTRY AND BIOCHEMISTRY

15 Chemistry of the Universe

174/SIO141 Chemical Principles of Marine Systems

COMMUNICATION

COCU 148 Communications & Environment

COGR 200A Introduction to the Study of Communication as Social Force

COGR 280 Advanced Workshop in Communication Media

ECONOMICS

ECON130 Public Policy

ECON131 Economics of the Environment

ECON132 Energy Economics

ECON133 International Environmental Agreements (prerequisite microeconomics)

ECON144 Economics of Conservation (prerequisite microeconomics)

ECON145 Economics of Ocean Resources (prerequisite microeconomics)

ENVIRONMENTAL STUDIES

ENVR 110 Environmental Law

ENVR 130 Environmental Issues

ENVR 140 Wilderness and Human Value

SCHOOL OF GLOBAL POLICY AND STRATEGY (FORMERLY IRPS)

IRCO 400 Policy Making Processes

IRCO 412 Globalization World Systems

IRGN 413 Corp Strategy & the Environment

IRGN 418 Green Technology/Science & Policy
IRGN 453 Sustainable Development
IRGN 458/258 International Environmental Policy
IRGN 465 Management of Non-Profit Organizations
IRGN 457 Cost-Benefit Analysis
IRGN 487/289 Applied Environmental Economics

HISTORY:

HISC 105 History of Environmentalism
HISC 131 Science, Technology & Law
HIUS154 Western Environmental History

LITERATURE

LTWR 122 Writing for the Sciences
LTWR 165 Literature and the Environment
LTCS 165 The Politics of Food

RADY SCHOOL OF MANAGEMENT

MGT 103 Product Marketing and Management
MGT 166 Corporate Social Responsibility
MGT 270 Project Management
MGT 478 Marketing Communication

PHILOSOPHY

137 Moral Psychology
148 Philosophy and the Environment
247 Philosophy of Biology

POLITICAL SCIENCE

POLI 103A CA Government and Politics
POLI 110M Green Political Thought
POLI 125A Communities and the Environment
POLI 125B Politics of Food/Global Economy
POLI 151 International Organizations
POLI 162 Environmental Policy

SCRIPPS INSTITUTION OF OCEANOGRAPHY

SIO 248 Marine Paleo Ecology
SIO 260 Marine Chemistry
SIO270 Pelagic Ecology
SIO 270A Fisheries Oceanography
SIO 274 Natural History Below the Tides
SIO 275B Natural History/Coastal Habitats
SIO 277 Deep Sea Biology
SIO 278 Ocean Biosciences
SIO 280 Biological Oceanography

SIO 281 Marine Physiology
SIO 283 Phycology
SIO 286 Marine Science, Economics and Policy
SIO 287A Marine Microbial Ecology
SIO 294 Biology of Fishes
SIO 296 Behavior and Ecology of Fishes

SOCIOLOGY

SOCI130 Population and Society
SOCI137 Sociology of Food
SOCI149 Sociology of the Environment
SOC171 Technology and Science

URBAN STUDIES

USP144 Environmental and Preventative Health Issues
USP171 Sustainable Development

VISUAL ARTS

110G The Natural and Altered Environment
213 Public Space
215 Human Interface

Appendix E4 - Interdisciplinary Forum on Environmental Research Examples

THE INTERDISCIPLINARY FORUM ON ENVIRONMENTAL RESEARCH PRESENTS



I KE
wisdom to whisper



WHEN: Tuesday 4:00 pm, January 27, 2015
WHERE: IGPP Room 303 ("Munk Room"), Judith and Walter Munk Laboratory, Scripps Institution of Oceanography, UC San Diego, [Map](#)
WHAT: Film Premiere + Discussion with Filmmaker Cliff Kapono and Producer Kahana Kalama

At the interface between tradition and innovation, this short documentary takes audiences on a journey through French Polynesia to explore the relationship between indigenous knowledge and modern science. Perspectives from politicians, community leaders, visiting scientists, and cultural practitioners are shared alongside compelling imagery of Tahiti's natural BEAUTY. A major goal of the film is promote a discussion between both local and international community members as a means of cultivating impactful ocean conservation efforts.

Snacks and drinks provided. Trailer: <http://vimeo.com/109082370>




Critical Ecologies
Research Forum

The Interdisciplinary Forum on Environmental Change Presents:

CLIMATE GEOENGINEERING: SCIENTIFIC AND HUMAN DIMENSIONS


WHEN: Tuesday April 21, 2015, 4:00-6:00 pm

WHERE: IGPP Munk Room 303, Scripps Institution of Oceanography, UCSD

WHAT: The long residence time of CO₂ and our consistent failures in cutting carbon emission will further exacerbate the negative effects of climate change. In the future, we may need to conduct geoengineering to stop a "climate emergency" - by reflecting a portion of the incoming solar radiation or sequestering atmospheric carbon. Geoengineering is an interdisciplinary and complex issue: it concerns not only scientific research and technical feasibility, but also involves local/global policy decision and ethical debates. Join us for a discussion on this controversial but very important and timely topic.

The Interdisciplinary Forum on Environmental Change Presents:

FORCE MAJEURE






**Newton & Helen
Mayer Harrison**

May 6, 2014, 4-6pm
Summer Auditorium, Scripps Institution of Oceanography, [Map](#)

"Beginning with globalization six thousand years ago with the Salt Route, a little later, the Silk Route... and later and later... Especially with science informed by Descartes' clock, and with modernity recreating the cultural landscape and deconstructing nature thereby, from the Industrial Revolution to the present, until at once a new force has become apparent. We reframe a legal meaning ecologically, and name it the Force Majeure"
[Poster Download Link](#)

Join Eco-art pioneers Newton and Helen Mayer Harrison as they contemplate "Force Majeure", both an artwork in itself and a namer for the collective forces that are rapidly changing our world into an uninhabitable place.

Critical Ecologies
Research Forum



The Interdisciplinary Forum on Environmental Change Presents:

THE FIN ART OF RAY TROLL OR HOW I BECAME A SCIENTIFIC SURREALIST



When: Tuesday 4:00 pm, November 18, 2014

Where: Judith and Walter Munk Laboratory, IGPP Room 303, Scripps Institution of Oceanography, UC San Diego, [Map](#)

What: Join us for a lively presentation by the one-of-a-kind ichthyologist-artist Ray Troll, followed by a discussion on creative approaches to educational outreach. More on Ray's Artwork is found [here](#). Refreshments and snacks will be provided.



Critical Ecologies Research Forum

Appendix E5- Group Research Examples



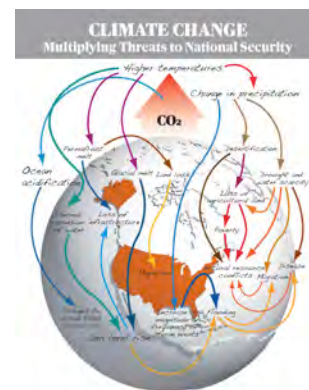
Integrating climate and ocean sciences into the 19th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change.

Six students participated in the project with a goal was to bridge the gap between science and decision-making and encourage the adoption of science-based, action oriented language for climate mitigation. They provided side-panel events on 1) the Climate-Carbon Cycle, 2) Ocean Acidification and Economic Implications, and 3) Ocean Heat, the Arctic, and Sea Level Rise; they had personal meetings with delegates, generated a series of mini-documentaries, and developed a website Ocean Scientists for Informed Policy (<http://oceanscientists.org>). UCSD

donors continue to support participation at the annual COP.

National Security and Climate Change

Five students participated in the project to document threats to national security due to climate change impacts. Students conducted a literature review using sources from the U.S. Navy Task Force on Climate Change, National Research Council, Intergovernmental Panel on Climate Change, the Senate Committee on Climate Change, Department of Defense, among many others. They attended a workshop hosted by the Center for Environment and National Security and Climate change and interviewed participants. The resulting 15 page white paper was presented at conferences and to legislators in Washington DC and Sacramento.



NAVIGATING SUCCESS IN A SEA OF FAILURE



Applying Interdisciplinary Research to Investigate Perspectives on Marine Conservation Success

Carolina Bonin¹, Elizabeth Keenan^{1,2}, Matt Leslie^{1,3}, Levi Lewis¹, Tessa Pierce¹, Cotton Rodwood^{1,4} and Brian Zgliczynski¹
¹Orlando Sengco Beach, Alex Chis, Andrew Allen, Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography, University of California, San Diego; ²Marine Biology, University of California, San Diego; ³Marine Science and Technology, Scripps Institution of Oceanography, University of California, San Diego; ⁴Marine Science and Technology, Scripps Institution of Oceanography, University of California, San Diego

Navigating success in a sea of Failure: Applying Interdisciplinary Research to investigate perspective on marine conservation success

The objective was to study conservation success stories, associating them with surveys to investigate how stakeholders perceive “success” in conservation. The 2nd International Marine Conservation Congress (IMCC) provided the opportunity to carry out surveys and interviews within the conservation community. Observations were summarized in a white paper and presented at the 3rd IMCC conference.

Appendix E6 - Internship Examples

Internships open doors for PhD graduates and provide for alternate career paths beyond academia. You'll find graduates at NOAA National Marine Fisheries Service, Union of Concerned Scientists, U.S. EPA, The Nature Conservancy and other government and non-government organizations.

Lauren Freeman (SIO), served her internship with the International Union for Conservation of Nature (IUCN), Washington, D.C. She organized and developed a database framework for a worldwide coral reef resilience program. Lauren's connections in Washington D.C resulted in a position with the National Research Council.

Ben Gilbert (Economics) served with the Northeast Fisheries Science Center, in Woods Hole, MA where he compiled large data sets pertaining to the 1,500 vessels holding ground fish permits between 1994 and 2009. The relationship resulted in a Marine Economist position with NOAA Northwest Fisheries Science Center in Seattle. He is the second economics graduate who trained with the program who is now serving with NOAA Fisheries (Jason Murray - at NOAA in Silver Springs, MD)

Grantley Galland (SIO), also served with IUCN. His objective to incorporate the ocean more significantly into the international climate change negotiation process. The 70 page paper and 12 page executive summary he co-developed were officially launched at the Conference of the Parties (COP) held in Copenhagen in 2009. CMBC has continued Grantley's objective and has had students & faculty at the COP in Doha, Poland, Peru, and later this year in France. He is now working with Pew Charitable Trusts on fisheries issues.



Jonathan Mark (Poli Sci) served his internship at the Peace Research Institute, Oslo, Norway where he was researching climate change and conflict. Upon his return he spearheaded the group research project on that climate and national security. He has a position with the University of Southern California on environmental policy upon graduation

Amy Van Cise (SIO) served her internship with the North Slope Borough's Wildlife Management Division in Barrow Alaska. Her research was to gain an understanding of how traditional ecological knowledge (TEK) is formally integrated with scientific research and resulting management decisions. Amy expects to defend her Ph.D. in 2016.

Appendix E7. Students currently on the PIER track

The Program for Interdisciplinary Environmental Research (PIER) provides graduate students from existing UCSD Ph.D. programs with the opportunity to specialize in research and training on the biological, physical, economic and social aspects of environmental research, conservation, and sustainability. The aim is to provide a broad and interdisciplinary approach – spanning the social and natural sciences– and focusing on solutions to global environmental issues. Through PIER, graduate students interact and communicate with peers in radically different disciplines throughout the duration of their PhD projects. Such communication across disciplines from the outset is key to fostering a capacity for interdisciplinary “language” skills and conceptual flexibility.

PIER is the evolution of the collaborative interdisciplinary research and graduate education developed with 10 years of support under NSF IGERT (Integrated Graduate Education and Research Training Program).

PIER Students 2014-2015

Isla Globus Harris (Economics - San Diego Fellowship Awardee)

Isla’s research interests are game theory and environmental economics, and her current projects focus on wildlife smuggling, ivory markets and carbon offsets. Isla says *“I’m working on designing better carbon offset procedures. Economists don’t normally get to conduct transects via snorkel or go out to sea! More importantly, I’ve been exposed to the cutting-edge of scientific disciplines like ecology and climate science. Knowing what is happening in environmental and oceanographic science helps me hone my research topics in on the areas that are most relevant.”*

Jennifer Le (SIO - San Diego Fellowship Awardee)

Jennifer is combining her economics and ecology background in the study of ecosystem services in natural water treatment systems and in the deep sea with the Levin lab. Jennifer says *“The PIER Program has helped me realize the great importance of interdisciplinary research and collaboration through both coursework and opportunities, like attending COP20 in Lima. I am grateful to have had these experiences early in my career, so I can incorporate them into my current and future work. It exposed me to different facets of the same problem which will help me develop as a better scientist.”*

Rachel Diner (SIO San Diego Fellowship Awardee)

Rachel is working on functional genomics in Andrew Allen’s lab at the J. Craig Venter Institute in La Jolla. Rachel says *“The PIER program has broadened my experience this year by introducing me to new concepts about the meaning of biodiversity and conservation. In addition to learning about the multi-faceted nature of protecting and conserving marine resources (drawing from economics, policy, business, and communications, as well as science), I have discovered interesting new areas of research with important conservation implications, such as deep-sea natural resources and the widespread effects of climate change on ocean ecosystems and coastal resilience. I have learned new ways to communicate our increasing knowledge of biodiversity and conservation to the public.”*

Kaitlin Lowder (SIO)

Kaitlin is studying the effects of ocean acidification on calcifying marine organisms, this is just one aspect of a very large problem: society’s level of carbon burning. Fossil fuel usage has been linked to both climate change and ocean acidification, vast problems that do not have one easy solution. She says *“As a new student, it is easy to limit your circle to your lab, your cohort, and your few professors. However, the PIER program introduced me to the wider Scripps community and its diversity of research and knowledge right from the beginning. I feel so lucky to have heard lectures from Scripps experts during my summer class and now, through CMBC, I have the opportunity to share my research in the future too.”*

PIER Students 2015-2016

Remy Levin (Economics - San Diego Fellowship Awardee)

Remy's research questions are at the intersection of environmental and development economics, especially regarding land use, climate, and species preservation. Remy says "*I've seen poverty firsthand and was made aware of the atrocious economic conditions under which a large fraction of humanity lives, as well as the tremendous environmental degradation that is a direct consequence of these conditions. It is my sincere hope that PIER will allow me both to dedicate my time more fully to research, and to be exposed to cutting edge interdisciplinary work that will fuel my research agenda for years to come.*"

Rishi Sugla (SIO - San Diego Fellowship Awardee)

Rishi studies the physiological and geochemical consequences of low oxygen and biological production in marine environments. Rishi comments "*Through tools I hope to gain through PIER, I strive to link geochemical proxies of paleoclimates to past ecosystems and biological productivity. These topics are increasingly important as the results of climate change become visible with time, and should have major implications for how we predict ecosystem change in the future.*"

Clifford Kapono (Chemistry & Biochemistry - San Diego Fellowship Awardee)

Cliff is studying the chemical ecology of coral reefs and seeking a way to map the chemistry of microbial communities giving rise to unprecedented spatial and temporal insights into the chemical driving forces of microbial communities. Cliff plans on implementing new technology to spatially map complex microbial community interaction back onto coral reef 3D models. *I am particularly excited, as imaging mass spectrometry is one of the fastest emerging fields in science.*

Lynn Sun (Economics)

Lynn's research focuses on environmental and resource economics, energy market and public economics. Her empirical work is on investigating household electricity consumption in response to climate change. *I'm looking forward to meeting with students across several disciplines through the CMBC summer program, and we can work together to use interdisciplinary approaches to address topics like global change, marine ecosystem conservation, and ocean energy development.*

Appendix E8. IGERT students on the PIER track

The PIER Specialization is based on the requirements of the NSF Funded IGERT program. In the last year of the IGERT (2012) the students listed below started on the track that we now call PIER. All have completed 16 to 22 of the unit requirements and one student* has completed all 30 units. We expect these students will petition for the Specialization should the program be approved. Several of these students helped in the development of this proposal and we thank them for their service and dedication to the program.

Yassir Eddebbar, Oceanography

Kate Furby, Marine Biology

Stephanie Fried, Economics

Natalya Gallo, Oceanography

Matt Leslie, Marine Biology

Lauren Linsmayer, Marine Biology

Misha Miller-Sisson, Anthropology

*Nick Obradovich, Political Science

Ian Parker, Sociology

Sara Sanchez, Marine Biology

Tamara Sheldon, Economics

Amy VanCise, Marine Biology