



Scripps Institution of Oceanography Center for Marine Biodiversity and Conservation

SIO295/295L

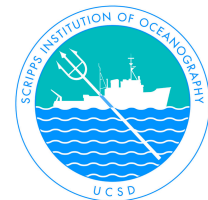


Climate Change and Marine Ecosystems Introduction to Marine Biodiversity and Conservation



Course Coordinator: Professor Jeremy Jackson

June 17 – August 28, 2009



**INTRODUCTION TO MARINE BIODIVERSITY AND CONSERVATION
SIO295 & SIO295L
GLOBAL CHANGE AND MARINE ECOSYSTEMS**

SUMMER 2009

COURSE OUTLINE / INDEX

June 17 - 19	ORIENTATION GENERAL COURSE NOTES & PRELIMINARY READING
Week 1: June 22 - 26	MARINE BIODIVERSITY Nancy Knowlton, Greg Rouse
Week 2: June 29 - July 2 HOLIDAY JULY 3	PHYSICAL & BIOLOGICAL OCEANOGRAPHY Jim Leichter, Myrl Hendershott
Week 3: July 6 - 11	ECOLOGY & ECOLOGICAL SYSTEMS (INCLUDES SAT - SPROUL) Stuart Sandin, Jeremy Jackson
Week 4: July 13 - 18	PALEOBIOLOGY AND CLIMATE (INCLUDES SAT - SPROUL) Richard Norris
Week 5: July 20 - 24	ECONOMICS I Joel Watson, Ted Groves, Dale Squires, Mark Jacobsen
Week 6: July 27 - 31	ECONOMICS II Joel Watson, Ted Groves, Dale Squires, Mark Jacobsen
Week 7: Aug 3 - 7	LAW, GOVERNANCE, POLITICS AND POLICY Kathryn Mengerink
Week 8: August 10-14	COMMUNICATIONS I and ENVIRONMENTAL ETHICS Chris Mooney, Craig Callender
Week 9: August 17 - 21	NGOS and COMMUNICATIONS II IUCN, Randy Olson
Week 10: August 24 - 28 August 24 - 27 August 27 August 28	FINAL WEEK Work on grant proposal Proposals due by 4:00 Class Party - 4:30 - 6:30 MAS Advising Meeting

Field Trips and Special Events

Participating Faculty, Scientists

Participating Guest lecturers

Additional CMBC Associated Faculty, Scientists and Advisors

Graduate Student Participants and Staff Support

UCSD and Other Academic Partners

Student Bios and Photos

Wednesday 17 June

- 09:00 - 09:30 Welcome & Introductions – Jeremy Jackson
- 09:30 - 09:35 CMBC overview - Jeremy Jackson
- 09:35 - 09:45 Interdisciplinary Program Overview - Dick Norris
- 0945 - 09:55 MAS Program Overview - Russ Chapman
- 09:55 - 10:10 SIO Graduate office – Josh Reeves
- 10:10 - 10:20 MAS Program administration - Jane Weinzierl
- 10:20 - 10:40 BREAK
- 10:40 - 11:10 Summer Course Content & Organization - Jeremy Jackson
- 11:20 - 11:30 Questions/Answers
- 11:30 - 12:30 SIO Library orientation - Amy Butros
- 12:30 - 13:30 LUNCH BREAK
- 13:30 - 16:00 Tour of SIO & UCSD & Student ID cards (appointment for ID 1:30 – 3:30)

Thursday 18 June

- 09:00 - 11:00 MAS students Administration Meeting- Study trailer - Keys Issued
Meet with Dick Norris & Russ Chapman
- 09:00 - 10:00 New PhD Office assignments/keys issued
- 10:00 - 13:00 Student ID cards (if not complete on Wednesday, must be done in the morning)
- 14:00 – 15:00 Naomi Oreskes – Science in Context
- 15:00 – 16:00 Lisa Shaffer – Climate Change
- 16:00 – 17:00 Joel Watson – Introduction to Economic Reasoning

Friday 19 June

- 09:00 – 10:00 FOREIGN STUDENTS – must attend orientation at the International Center.
- 15:00 - 16:00 Nancy Knowlton – Marine Biodiversity
- 16:00 - 17:00 Jeremy Jackson – Brave New Ocean
- 17:00 - 19:00 Welcome Reception in conjunction with SIO TG - T-29

GENERAL COURSE NOTES & PRELIMINARY READING

REQUIRED READING - PRIOR TO JUNE 21, 2008

Economics: A very short introduction

by: Partha Dasgupta

Storm World: Hurricanes, Politics and the Battle Over Global Warming

by: Chris Mooney

Cod: A Biography of the Fish that Changed the World

By: Mark Kurlansky

Fundamental Processes in Ecology: An Earth Systems Approach

By D.M. Wilkinson

PRELIMINARY READINGS FOR INTRODUCTORY LECTURES

WBGU (2006) Future Oceans – Warming Up, Rising High, Turning Sour

Nordhaus, William D. 1993. Reflections on the Economics of Climate Change. *The Journal of Economic Perspectives*, 7(4):11-25

Oreskes, N. (2007) The Long Consensus on Climate Change. Washington Post

Bouchet, P. 2006. The magnitude of marine biodiversity. Chapter 2: The Exploration of Marine Biodiversity: Scientific and Technological Challenges.

Jackson, J.B.C. 2008. Ecological extinction and evolution in the brave new ocean. *Proceedings of the National Academy of Sciences USA* 105:11458-11465.

ASSIGNED READINGS

Readings listed in this syllabus are available on the CD provided. If you have a problem opening any item, please send an email to pdockry@ucsd.edu. Additional readings may be posted on the class website: http://cmbc.ucsd.edu/Students/Current_Students/SIO295/

COURSE PROJECT REPORTS (3)

Each student shall prepare three project reports that will require research and evaluation of topics in climate, economics, fisheries, and biodiversity (as described in subsequent sections). ALL project reports will be no more than 10 pages of text, double spaced, 12-point type plus tables and references. All reports are due at the beginning of class on the due date. Biodiversity report is due July 6. Fisheries and ecosystems report is due July 20. Economics of climate changes report is due August 3.

FINAL PROJECT

Each student shall prepare a grant proposal as a final project. These are due August 27 at 4:00 p.m. Grant template is provided on the CD.

FIELD TRIPS -Staging for field trips is outside the SIO Library at CUPS.

COURSE EVALUATION

All evaluations are intended to be anonymous. We encourage you to voice your opinion and provide constructive criticism. Evaluation forms, provided in your syllabus, are to be completed at the end of each week. These can be handed to the course assistant or brought to room 2155 Hubbs Hall or sent electronically (blank form on your CD) to pdockry@ucsd.edu. This information is used to determine improvements to the course for the following year.

In addition, you will receive an email request from the university at the end of the course to complete an on-line evaluation. This will include the overall course and key faculty evaluations (Jackson, Knowlton, Norris, Leichter, Sandin, Watson, Groves, Squires). These evaluations are used by the institution for faculty reviews.

LOCATIONS & WEBSITES

Lectures are held in 4500 Hubbs Hall. Labs are held in 3300 Hubbs Hall unless otherwise instructed. Please check class website regularly for last minute changes, posting of lecture notes as they become available and other updates: <http://cmbc.ucsd.edu/about/students.cfm>

Incoming Graduate student handbook is available from Office of Graduate Studies and Research: <http://ogsr.ucsd.edu/welcome/index.htm>

BREAKS -

Regular 20-minute breaks are scheduled in the morning and afternoon with a one hour lunch break. If the instructor fails to break, please remind him or her.

MORNING BREAKS ARE AT 10:20 – 10:40

AFTERNOON BREAKS ARE AT 2:20 – 2:40

WEEK 1**JUNE 22 –26****MARINE BIODIVERSITY**

Instructors: Nancy Knowlton, nknowlton@ucsd.edu or knowlton@si.edu
Farooq Azam, x46850, fazam@ucsd.edu
Ron Burton, x25784, rburton@ucsd.edu
William Perrin, William.Perrin@noaa.gov
Phil Hastings, x22913, phastings@ucsd.edu
Tony Koslow, x47284, jkoslow@ucsd.edu
Lisa Levin, x43579, llevin@ucsd.edu
Greg Rouse, x47973, grouse@ucsd.edu
Russ Chapman, x21706, rchapman@ucsd.edu
Jennifer Smith x 60803, smithj@ucsd.edu
Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu
Eddie Kisfaludy, x44777, ekisfaludy@ucsd.edu

Monday 22 June

09:00 - 10:20 Lecture (Knowlton) The Tree of Life
10:40 - 12:00 Lecture (Knowlton) Species and Speciation
LUNCH BREAK
13:00 - 14:20 Lecture (Azam) Marine Microbes
14:40 - 16:00 Lab (Azam) Marine Microbes

Tuesday 23 June

09:00 - 10:20 Lecture (Knowlton) Global Patterns of Marine Biodiversity
10:40 - 12:00 Lecture (Levin) Estuaries and Wetlands
LUNCH BREAK
13:00 - 14:20 Lecture (Chapman) Algae: The World's Most Important "Plants"
14:40 - 16:00 Lecture/Lab (Smith/Kisfaludy) Seaweed Biodiversity/Algae Lab

Wed 24 June

09:00 - 10:20 Lecture (Knowlton) Coral Reefs
10:40 - 12:00 Lecture/Lab (Perrin) Marine Tetrapod Diversity
LUNCH BREAK
13:00 - 14:30 Lecture/Lab (Rouse) Invertebrates
15:00 - 16:00 Lab (Rouse) Invertebrates

Thursday 25 June

09:00 - 10:20 Lecture (Burton) Genetic Diversity
10:40 - 12:00 Lecture (Rouse) Pelagic Invertebrates
LUNCH BREAK
13:00 - 14:20 Lecture (Hastings) Diversity of Fishes
14:40 - 16:00 Lab (Hastings) Major groups of fishes

Friday 26 June

09:00 - 10:20 Lecture (Koslow) Discovery, Ecology and Conservation of the Deep Sea
10:40 - 12:00 Lab (Norris/Rouse/Townsend) SIO Collections
LUNCH BREAK
13:00 - 14:30 Lab (Hastings) Tour of Birch Aquarium at Scripps

Monday 22 June

Baldauf, S. L. 2003. Phylogeny for the faint of heart: a tutorial. *Trends in Genetics* 19:345-351

Mace, G. M. et. al. 2003. Preserving the Tree of Life. *Science* 300:1707-1709

Azam, F and F Malfatti. 2007. Microbial structuring of marine ecosystems. *Nature Rev. Microbiol.* 5: 782-791.

Palumbi, S. 1994. Genetic divergence, reproductive isolation, and marine speciation. *Annual Reviews of Ecology and Systematics* 25:547-572

Knowlton, N. 2000. Molecular genetic analyses of species boundaries in the sea. *Hydrobiologia* 420: 73-90 (especially pages 73 - 75)

Tuesday 23 June

Dunn, CW et al. 2008. Broad phylogenomic sampling improves resolution of the animal tree of life. *Nature*

K. Bromberg Gedan, B.R. Silliman, M.D. Bertness. 2009. Centuries of Human-Driven Change in Salt Marsh Ecosystems. *Annual Review of Marine Science*, Vol. 1: 117-141

Wednesday 24 June

Knowlton, N. 2008. Coral reefs. *Cur. Biol.* 18: R1-R4.

Knowlton, N. 2001. The future of coral reefs. *Proceedings of the National Academy of Sciences USA* 98:5419-5425

Knowlton, N., and J.B.C. Jackson. 2008. Shifting baselines, local impacts, and global change on coral reefs. *PLOS Biology* 6:e54.

Gray, J. S. 2001. Marine diversity: the paradigms in patterns of species richness examined. *Scientia Marina* 65 (suppl 2):41-56

Thursday 25 June

Burton, R. S. 2009 Molecular Markers, Natural History and Conservation of Marine Animals. *Bioscience* (in press)

Macpherson, E. et al. 2007. Macroecological patterns among marine fishes. *Marine Macroecology.* 1-35

Friday 26 June

Koslow, T. 2007. *The Silent Deep*, Chapter 6: Seamounts and deepwater coral reefs 114-133

Koslow, T. 2007. *The Silent Deep*, Chapter 10: Deepwater fisheries. 197-224

ASSIGNMENT: Project I – Due July 6

Choose one of the 1,530 marine species on the IUCN Redlist (<http://www.iucnredlist.org/search>). What was the scientific basis for this listing?? How strong is the evidence for that decision? What is the status of the species today? Has it improved or declined since listing began?

WEEK 2 JUNE 29 – JULY 2 PHYSICAL AND BIOLOGICAL OCEANOGRAPHY

Instructors: Jim Leichter, x25330, jleichter@ucsd.edu
 Myrl Hendershott x45705 mhendershott@ucsd.edu
Lecturers: Jeff Crooks, Tijuana Estuary, jacrooks@yahoo.com
Course assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

Monday 29 June

09:00 - 10:20 Lecture (Leichter) Phytoplankton and Light
10:40 - 12:00 Lecture (Leichter) Nutrients and New Production
LUNCH BREAK
13:00 - 16:00 Laboratory/Discussion (Leichter) Phytoplankton, Zooplankton, Nutrients

Tuesday 30 June

09:00 - 10:20 Lecture (Leichter) Energy Flow and cycling, iron limitation
09:00 - 10:20 Lecture (Hendershott) How we think about air/water motion
LUNCH BREAK
13:00 - 14:20 Lecture (Hendershott) How we observe the motion of water
14:30 - 16:00 Pier Tour/Discussion (Leichter) Pier observation of waves
NOTE: Dress appropriately; pier can be cold and windy

Wednesday 1 July

09:00 - 10:20 Lecture (Hendershott) Tides and Currents
10:40 - 12:00 Lecture (Hendershott) Interval Waves and Transport
LUNCH BREAK
13:00 - 14:20 Laboratory/Discussion (Leichter) Hydraulics Lab - Wave tanks
A visual exploration of water flow, internal waves, rotation flow, settling velocity ***Close-toe shoes required***
14:30 - 16:00 Laboratory/Discussion (Leichter) Field data, time series, data analysis

Thursday 2 July

7:45 - 8:30 Field trip (Leichter/Jackson/Crooks) Coastal landscapes, coastal cities, and coastal problems.
08:30 - 12:00 Tijuana Estuary
The ecological and social history of Tijuana estuary and present challenges.
The restoration and construction of estuarine habitat
Components of a tidal lagoon/estuary
Life on the border - human struggles and environmental impacts
12:00 - 13:00 Return to SIO
BREAK
14:00 MAS Advising Meeting (Norris, Chapman)

FIELD TRIP: Assemble at 7:45 a.m. Be prepared to be hot, thirsty, sunburned, wet and muddy. Sunscreen, a hat, long sleeve shirt and long pants are best. Flip Flops are discouraged and old tennis shoes that can get wet and muddy are best.

Friday 3 July HOLIDAY

WEEK 2**June 29 – July 2****READINGS**

Monday 29 June

Green et al. 2009. Advances in Conservation Oceanography. *Oceanography* 22(1) 210-223

Gross, M. G. 1985. Oceanography, 5th ed. Merrill Earth Science Series. Pages 35-49, 51-64,133-191

Tuesday 30 June

McCormick & Thiruvathukal. Elements of Oceanography, 2nd edition, Saunders College Publishing. Chapter 6 (p. 169-191)

McCormick & Thiruvathukal. Elements of Oceanography, 2nd edition, Saunders College Publishing. Chapter 8 (p. 221-247)

Wednesday 1 July

Lalli and Parsons. Biological Oceanography An Introduction. The Open University. Chapter 3, pp39–73

Lalli and Parsons. Biological Oceanography An Introduction. The Open University. Chapter 4 pp 74–111.

Kolbert, Elizabeth. 2008. The Island in the Wind: A Danish community's victory over carbon emissions. The New Yorker.

Thursday 2 July

Lalli and Parsons. Biological Oceanography An Introduction. The Open University. Chapter 5, pages 112 - 146.

Doney, Scott C. 2006, "The Dangers of Ocean Acidification" Scientific American, March 2006, pp 58-65

Martin, J.H. et al.1990. Iron in Antarctic Waters. *Nature* 345:156-158.

Coale, K.H. et al. 1996. A massive phytoplankton bloom induced by an ecosystem-scale

Friday 3 July HOLIDAY

WEEK 3**JULY 6 – JULY 11****ECOLOGY & ECOSYSTEMS**

Instructors: Stuart Sandin, sandin@ucsd.edu, x44150
 Jeremy Jackson, jbjackson@ucsd.edu x22432
 Jennifer Smith, jsmith@nceas.ucsb.edu x60803
 Nancy Knowlton, nknowlton@ucsd.edu
 Paul Dayton, pdayton@ucsd.edu, x46740
 Forest Rohwer, frohwer@sunstroke.sdsu.edu, 619-594-7829
 Julia Baum, jkbaum@ucsd.edu, x25912

Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

Book: Wilkinson, D.M. (2006) *Fundamental Processes in Ecology: An Earth Systems Approach*, Oxford University Press.

PROJECT REPORT 1 DUE – BIODIVERSITY

Monday 6 July "Diversity and Ecosystem Function"
 09:00 - 10:20 Lecture (Sandin) Diversity and Ecosystem Function
 10:40 - 12:00 Lecture (Sandin) Food Webs
 LUNCH BREAK
 13:00 - 14:20 Lecture (Jackson) Shifting Baselines
 14:40 - 16:30 Lecture (Baum) Global Decline of Sharks

Tuesday 7 July "Fishing"
 09:00 - 10:20 Lecture (Jackson) "The fish that didn't get away"
 10:40 - 12:00 Lecture (Sandin) Status of marine fisheries
 LUNCH BREAK
 10:40 - 12:00 Lecture (Sandin) Ecosystem consequences of overfishing
 14:40 - 16:00 Discussion/Work groups: Is there a silver bullet in fisheries management?

Wednesday 8 July "Introduced species"
 10:40 - 12:00 Lecture (Smith) Introduced species and their consequences
 09:00 - 10:20 Lecture (Smith) Introduced species
 LUNCH BREAK
 13:00 - 14:20 Work groups: How do we cope with introduced species in a changing world?
 14:40 - 16:00 Discussion (Jackson, Smith, Sandin)

Thursday 9 July "Disease"
 09:00 - 10:20 Lecture (Sandin) Parasites, predators, and disease
 10:40 - 12:00 Lecture (Knowlton) Disease in tropical seas
 LUNCH BREAK
 13:00 - 14:20 Lecture (Rohwer) When marine microbes meet marine 'macrobes'
 14:40 - 16:30 Discussion/Work groups: Can we separate cause from effect in wildlife diseases and does it matter for conservation?

Friday 10 July "Old Fart's Day"
 09:00 - 10:20 Lecture (Jackson) Ocean Sewer: Eutrophication and dead zones
 13:00 - 14:20 Lecture (Dayton) Kelp forests & ghost stories
 LUNCH BREAK
 13:00 - 15:00 Discussion (Jackson, Dayton) What are the consequences of the top-down vs. bottom-up debate for conservation?

Sat 11 July All Day at Sea on the Sproul

Assemble at 6:45 a.m. Bus leaves at 7:00 a.m. (Lunch Provided)
 CLOSED-TOE SHOES REQUIRED – You will not be allowed to board without them.
 Government issued photo ID is required.
 Be prepared to be hot, wet, thirsty, and/or seasick. Please take appropriate precautions.
 Bring hat, sunscreen, binoculars and camera (if you have them) and enthusiasm

Monday 6 July

- Estes, J. A., N. S. Smith, and J. F. Palmisano. 1978. Sea otter predation and community organization in the western Aleutian Islands, Alaska. *Ecology* 59:822-833.
- Myers, R. A., J. K. Baum, T. D. Shepherd, S. P. Powers, and C. H. Peterson. 2007. Cascading effects of the loss of apex predatory sharks from a coastal ocean. *Science* 315:1846-1850.
- Worm, Boris, et. al. 2006. Impacts of Biodiversity Loss on Ocean Ecosystems. *Science* 314: 787-790
- Pauly, D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. *Trends Ecol. Evol.* 10:430.

Tuesday 7 July

- Jackson, J.B.C. et al. 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science* 293:629-639.
- Beddington, J. R., D. J. Agnew, and C. W. Clark. 2007. Current problems in the management of marine fisheries. *Science* 316:1713-1716.

Wednesday 8 July

- Williams, S. L., and J. E. Smith. 2007. A global review of the distribution, taxonomy, and impacts of introduced seaweeds. *Annual Review of Ecology and Systematics* 38:327-359.
- Ruiz, G.M. et al. 2000. Invasion of Coastal Marine Communities in North America: Apparent Patterns, Processes and Biases. *Annual Review of Ecology and Systematics* 31: 481-531
- Carlton, J.T. and J.B Geller. 1993. Ecological Roulette: The Global Transport of Nonindigenous Marine Organisms. *Science* 261 No. 5117: 78-82

Thursday 9 July

- Harvell, C. D., C. E. Mitchell, J. R. Ward, S. Altizer, A. P. Dobson, R. S. Ostfeld, and M. D. Samuel. 2002. Climate warming and disease risks for terrestrial and marine biota. *Science* 296:2158-2162.
- Kline, D. I., N. M. Kuntz, M. Breitbart, N. Knowlton, and F. Rohwer. 2006. Role of elevated organic carbon levels and microbial activity in coral mortality. *Marine Ecology Progress Series* 314:119-125.
- Lafferty, K. D., and A. M. Kuris. 1999. How environmental stress affects the impacts of parasites. *Limnology and Oceanography* 44:925-931.

Friday 10 July

- Dayton, P. K., M. J. Tegner, P. B. Edwards, and K. L. Riser. 1998. Sliding baselines, ghosts, and reduced expectations in kelp forest communities. *Ecological Applications* 8:309-322.
- Rabalais, N. N., R. E. Turner, B. K. Sen Gupta, E. Platon, and M. L. Parsons. 2007. Sediments tell the history of eutrophication and hypoxia in the Northern Gulf of Mexico. *Ecological Applications* 17:S129-S143.
- Dayton, P.K. Why nature at the University of California? *Transect* 26:2

Assignment: Project II - Due July 20

The harvest of marine species is largely managed on a case-by-case basis. Fisheries-based data are used to develop perspectives on the most effective means to support yield into the future. Identify a harvested marine population and summarize its management plan. Include information about each: (a) the geographic extent of the managed population, (b) the data used to design the management plan, (c) the management goals, and (d) the indicators used to test the efficacy of the management plan. Has management lived up to its goals? Explain. Note that these species can be fishes, invertebrates, seaweed, etc, but a proper quantitative management plan is a prerequisite for selection for this assignment.

July 9



Forest Rohwer is an associate professor at San Diego State University. He received his BAs in History, Chemistry, and Biology from Albertson College of Idaho and his PhD in Molecular Immunology from the joint doctoral program between San Diego State University and University of California, San Diego. Forest did his post-doctoral work in microbial ecology at Scripps Institution of Oceanography with Farooq Azam. His lab uses genomics, field surveys, and mathematics to study viral population dynamics and the roles of viruses in horizontal gene transfer. The lab also studies how microbes influence healthy corals and the role of microbes in coral reef degradation.

WEEK 4 JULY 13 - 18 CLIMATE, OCEAN CHEMISTRY, AND PALEOCEANOGRAPHY

Instructors: Richard Norris, rnorris@ucsd.edu, x22783
Andrew Dickson, adickson@ucsd.edu, x22990
Wolf Berger, wberger@ucsd.edu x 22545
Charlie Kennel, ckennell@ucsd.edu, x26524
Lara Hansen, lara@ecoadapt.org, 202-390-0140
Chris Mooney, moonecc@gmail.com

Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu
Celli Hull, phull@ucsd.edu

Monday 13 July

09:00 - 10:20 Lecture (Norris) Biology and Climate Change
10:40 - 12:00 Lecture (Dickson) Ocean Acidification
LUNCH BREAK
13:00 - 14:20 Lab (Norris) The hidden world of microfossils
14:40 - 16:00 Lab (Norris) The hidden world of microfossils

Tuesday 14 July

09:00 - 10:20 Lecture (Norris) Paleocology: Past Ecosystems Guide Us to the Future
10:40-12:00 Lecture (Berger) Trends in global sea level
LUNCH BREAK
13:00 - 16:00 Lab (Norris/Hull) Paleocology: reconstructing past ecosystems

Wed 15 July

09:00 - 12:00 Field Trip (Norris) Torrey Pines State Reserve (low tide at 8:30 am)
LUNCH BREAK
13:00 - 14:20 Lecture (Norris) Water—the Big Kahuna in Near-term Climate Impacts
14:40 - 16:00 Lab (Norris) Core lab: Making our own paleoclimate record

HOMEWORK ASSIGNMENT FOR THURSDAY on next page

Thus 16 July

09:00 - 10:20 Lecture (Hansen) Adaptation and resilience to climate change
10:40 - 12:00 Lecture (Hansen) How to guide conservation planning with climate change
LUNCH BREAK
13:00 - 16:00 Discussion/Lab (Hansen/Norris/Marhaver) Case studies of adaptation planning

Friday 17 July

09:00 - 10:20 Lecture (Norris) Climate change: How do we know what we know and do what we ought to
10:40 - 12:00 Lecture (Mooney) Storm world
LUNCH BREAK
13:00 - 14:20 Panel Discussion: Climate Change & Marine Ecosystems
Panel members: Kennel, Norris, Mooney, and Hansen

Saturday 18 July

6:15 - 18:00 All Day at Sea on the Sproul
Field Trip (Jackson, Norris, Rouse)
All Day at Sea on the Sproul (Lunch Provided)

*****Assemble at 6:45 a.m. ***** Bus leaves at 7:00 a.m.

CLOSED-TOE SHOES REQUIRED - You will not be allowed on board ship without them.

Government issued photo ID is required.

Be prepared to be hot, wet, thirsty and sea sick. Please take appropriate precautions.

As before, bring hat, sunscreen, binoculars, camera, and enthusiasm

Monday 13 July

Schubert et al. 2006. The future oceans—warming up, rising high, turning sour: German Advisory Council on Global Change (WBGU) pp.1-123.

Lenton, T.M., et al. 2008. Tipping points in the Earth's climate system. *PNAS* 105 (6) 1786-1793.

WAB 2007. National security and the threat of climate change. CNA Corp. pp 1-35.

Riebesell, Ulf. 2004. Effects of CO2 enrichment on marine phytoplankton. *Journal of Oceanography*. 60: 719-729

Tuesday 14 July

Zachos, J. et.al. 2001. Trends, rhythms and aberrations in global Climate 65 Ma to Present. *Science* 292:686-693

Field, D. et al. 2006. Planktonic Foraminifera of the California Current Reflect 20th Century Warming. *Science* 311:63-66

Wednesday 15 July

Barnett T.P. & D.W. Pierce. 2008. When will Lake Mead go dry? *Water Resources Research* 44: 1-10

Thursday 16 July

Hansen, Lara. 2003. Increasing the Resistance and Resilience of Tropical Marine Ecosystems to Climate Change. Chapter 6 in Buying Time: A User's Manual pp. 157 - 176

Hoffman, Jennifer. 2003. Designing Reserves to Sustain Temperate Marine Ecosystems in the Face of Climate Change. Chapter 5 in Buying Time: A User's Manual pp. 123 - 155

Heller, N. and E.S. Savaleta. 2009. Biodiversity management in the face of climate change: a synthesis of 22 years of recommendations. *Biological Conservation* 142:14-31

Friday 17 July

Somerville, Richard. 2006. Medical metaphors for climate issues. *Climatic Change* 76:1-6

Crutzen, P. 2006. Albedo enhancement by stratospheric sulfur injections: a contribution to resolve a policy dilemma. *Climatic Change* 77:211-219.

Wackernagel, M. et al. 2002. Tracking the ecological overshoot of the human economy. *PNAS* 99 (14) 9266-9271

PREPARATION FOR THURSDAY JULY 16

Bring with you to class a conservation plan or management challenge that is vulnerable to climate change but for which climate change is currently not included in the plan. (You could pick one that does have climate change included and we could assess it, but it might be less constraining to start from a blank slate. You pick.)

To support this case study, bring maps, synopses, picture, whatever you feel would be valuable information for describing the conservation challenge. Feel free to caucus with classmates beforehand to create groups that are interested in working on a common topic. The goal is to make the work we do in the afternoon as relevant to your interests and career (academic and professional) as possible.

You will not have to formally present any of the homework, but it will be useful for the afternoon exercise where you will work to develop a climate change "adaptation" strategy.

CLIMATE

July 16 & 17



Lara J. Hansen has directed research on the biological effects of global change (including UV-B and global warming) since 1990. Her primary focus is the redesign of conservation strategies to incorporate responses to climate change. She has field projects around the planet exploring this issue, from coral reefs to mountain glaciers, from tigers in mangrove forests to polar bears in the Bering Sea. She advises on coral reef monitoring and adaptation projects in the U.S., Indonesia, Fiji, the Philippines and Belize. With multi-institutional colleagues she has developed a three country (Tanzania, Cameroon and Fiji) GEF/UNEP funded project on mangrove restoration and protection in response to climate change. She was the lead author/editor of a key text on the issue of natural system adaptation to climate change, *Buying Time: A User's Manual for Building Resistance and Resilience to Climate Change in Natural Systems*. This manual led to the development of an engaged stakeholder process to help resource managers and conservation practitioners create adaptation strategies applicable to their own workplans. This approach is employed in *Climate Camp* workshops. She is currently keenly engaged in developing the field of adaptation, building its capacity and getting it implemented. Her research has included examining the impacts of UV-B on marine organisms in Florida, Hawaii and Alaska, larval anuran species in California and marine bacteria in the Pacific. Recognition for her work on the biological effects of stresses combined with UV-B radiation is exemplified by being named as a Switzer Environmental Fellow in 1995 and an EPA Bronze Medal in 2002. Dr. Hansen was the Chief Climate Change Scientist for World Wildlife Fund leading their Impacts and Adaptations program from 2001 to 2008. In May 2008 she founded EcoAdapt, an organization with the primary goal of assisting in the development and implementation of adaptation strategies in response to climate change. In addition to her research and science experience, she also explains the effects of climate change to a broad array of audiences, including the U.S. Senate, media outlets and academic institutions. She has also served on the Nobel Peace Prize awarded Intergovernmental Panel on Climate Change for over five years. She earned her Ph.D. in Ecology at the University of California, Davis (1998) and her B.A. in Biology from the University of California, Santa Cruz (1991). Her post-doctoral research was with the USEPA, Office of Research and Development, Gulf Ecology Division.

July 17, (AND COMMUNICATIONS August 10 & 11)

Chris Mooney is a freelance writer and author of two books, the New York Times bestselling [The Republican War on Science](#)— named a finalist for the 2005 Los Angeles Times book prize in the category of "Science and Technology," and [Storm World: Hurricanes, Politics, and the Battle Over Global Warming](#)--dubbed "riveting" by the Boston Globe and selected as a 2007 best book of the year in the science category by Publisher's Weekly.



Chris's 2005 Mother Jones feature story about ExxonMobil, conservative think tanks, and climate change was nominated for a National Magazine Award in the "public interest" category (as part of a cover package on global warming). Chris's 2005 article for Seed magazine on the Dover evolution trial was included in the volume Best American Science and Nature Writing 2006. In 2006, Chris also won the "Preserving Core Values in Science" award from the Association of Reproductive Health

Professionals.

Chris's blog, "The Intersection," was a recipient of Scientific American's 2005 Science and Technology web award, which noted that "science is lucky to have such a staunch ally in acclaimed journalist Chris Mooney."

WEEK 5**JULY 20 -24****ECONOMICS**

Instructors: Dale Squires, 546-7000, dsquires@noaa.gov
 Joel Watson, x 46132, jwatson@ucsd.edu
 Ted Groves, x 42818, tgroves@ucsd.edu
 Mark Jacobsen, x27767, m3jacobsen@ucsd.edu
 Class assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

PROJECT REPORT II DUE – ECOSYSTEMS and FISHERIES

Monday 20 July INTRODUCTION TO ECONOMIC THINKING AND ANALYSIS
 WELL-FUNCTIONING MARKETS
 09:00 - 10:20 Seminar (Groves): Fundamental Questions of Economics and the Environment;
 Human Use of Resources (Goals): Consumption & Surplus; Productive &
 Carrying Capacities; Sustainability & Efficiency
 10:40 - 12:00 Class Exercise (Watson): Simulation I (markets and efficiency)
 LUNCH BREAK
 13:00 - 14:20 Lecture (Groves): Property Rights & Markets I
 14:40 - 16:00 Discussion (Groves/Watson): Goals: Economists vs. Rest-of-the-World

Tuesday 21 July WELL-FUNCTIONING MARKETS AND MARKET FAILURES
 09:00 - 10:20 Lecture (Groves): Markets II
 10:40 - 12:00 Class Exercise: (Watson): Simulation II (market failure)
 LUNCH BREAK
 13:00 - 14:20 Lecture (Groves): Commons, Public Goods, Externalities
 14:40 - 16:00 Class Exercise (Groves/Watson): ITQ's; Tradable Permits

Wednesday 22 July REGULATION
 09:00 - 10:20 Lecture (Groves/Jacobsen): Regulation: Direct and Indirect
 10:40 - 12:00 Class Exercise (Groves/Watson): Valuation Exercise
 LUNCH BREAK
 13:00 - 14:20 Lecture (Jacobsen): Examples of Regulatory Schemes
 14:40 - 16:00 Discussion (Jacobsen/Groves/Watson): Cap and Trade vs. Pollution Taxes

Thursday 23 July FISHERIES I
 09:00 - 10:20 Lecture (Squires): Bioeconomic models I
 10:40 - 12:00 Lecture (Squires): Bioeconomic models II
 LUNCH BREAK
 13:00 - 16:00 Seminar (Squires): Review of Bioeconomic models I & II and movie

Friday 24 July FISHERIES II
 09:00 -10:20 Lecture (Squires): Bioeconomic models III
 10:40 - 12:00 Exercise/Discussion (Squires): ABASIM management simulation
 LUNCH BREAK
 13:00 - 14:20 Seminar (Squires): Economics of Conservation and Fisheries Management
 14:40 - 16:00 Seminar (Squires): Ecological trade-offs in the Eastern Pacific Ocean

Monday 20 July

Dasgupta: Preassigned Readings for Introductory Seminar and Lecture

Dasgupta, Chapter 7 for afternoon discussion

Tuesday 21 July

(To be announced and distributed)

Wednesday 22 July

Hardin, Garrett. 1968. The Tragedy of the Commons. *Science* 162:1243-1248

Thursday 23 July

Hartwick, J.M., and Olewiler, N.D. 1998. The Economics of Natural Resource Use, 2nd ed. Addison-Wesley. Chapter 4

Friday 24 July

Hartwick and Olewiler, chapter 5 pp. 138-152

Pauly, Daniel et al. 2002. Towards sustainability in world fisheries. *Nature*, 418: 689-695. (Recommended)

Pauly, Daniel et al. 1998. Fishing down marine food webs. *Science*, 279: 860-863. (Recommended)

**Assignment: Project III – Due August 3
Economics and Climate –**

Choose one of the ten U.S. economy wide cap-and-trade bills introduced in the 110th congress (2007-2008). Suppose you are hired as a lobbyist for some constituency (e.g. a conservation group, the electric power industry, manufacturers generally, etc.). What would be your main economic arguments (as opposed to political or other arguments) to congress members as to why they should support or oppose the specific legislation. In order to present a convincing argument, you must also rebut the main economic arguments of your opponents. Consider the competing incentives of the different groups behind the bill you study, and make use of primary source material from any congressional hearings or journalistic discussion.

A listing and brief summary of the ten bills is provided here:

<http://www.pewclimate.org/docUploads/Chart-and-Graph-120108.pdf>

If you would prefer to study a climate bill not included in this list please check with one of us first. (A more comprehensive listing of climate-related bills in the 110th congress can be found at:

http://www.pewclimate.org/what_s_being_done/in_the_congress/110thcongress.cfm)

WEEK 6**JULY 27 – 30****ECONOMICS**

Instructors: Dale Squires, x 22790, dale.squires@noaa.gov
 Ted Groves, X42818, tgroves@ucsd.edu
 Joel Watson, x46132, jwatson@ucsd.edu
 Mark Jacobsen, x27767, m3jacobsen@ucsd.edu

Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

Monday 27 July

09:00 - 10:20

10:40 - 12:00

LUNCH BREAK

13:00 - 14:20

14:40 - 16:00

FISHERIES, GAMES I

Seminar (Squires): Norms and Incentives, Artisanal fisheriesSeminar & Discussion (Squires): Direct, indirect, and opportunity Costs:
Conservation Payments and EcotourismLecture (Watson): The Basics of Game Theory I (Static Settings)Discussion/Group Activity (Watson): Rational Behavior, Strategic TensionsTuesday 28 July

09:00 - 10:20

11:40 - 12:00

LUNCH BREAK

13:00 - 14:20

14:40 - 16:00

GAMES II, CONTRACTS

Lecture (Watson): The Basics of Game Theory II (Dynamic Settings)Lecture/Group Activity (Watson): Individual Incentives and CooperationLecture (Watson): An Introduction to Contracts and EnforcementSeminar (Watson): Community Enforcements and InstitutionsWednesday 29 July

09:00 - 10:20

10:40 - 12:00

LUNCH BREAK

13:00 - 14:20

14:40 - 16:00

INTERNATIONAL AGREEMENTS, CLIMATE CHANGE I

Lecture (Groves/Watson): International AgreementsDiscussion (Groves): Fur Seal Treaty; Montreal TreatyLecture (Jacobsen): Simple Trade-offs of Climate ChangeSeminar (Jacobsen & Groves): Kyoto, Stern Report, and BeyondThursday 30 July

09:00 - 10:20

10:40 - 12:00

LUNCH BREAK

13:00 - 14:20

14:40 - 16:00

CLIMATE CHANGE II, OTHER EXAMPLES

Lecture (Jacobsen): Existing Cap & Trade Systems and California's AB32Discussion, Group Activity (Groves/Jacobsen/Squires/Watson):

Preparation for Climate Change Negotiation Exercise

Lecture (Groves/Squires): TurtlesDiscussion and MovieFriday 31 July

09:00 - 12:00

LUNCH BREAK

13:00 - 14:20

14:40 - 16:00

CLIMATE CHANGE III, WRAP UP

Simulation (Groves/Jacobsen/Squires/Watson): Climate Change NegotiationDiscussion (Groves/Jacobsen/Squires/Watson): Negotiation ResultsWrap-up discussion economics module (Jacobsen/Groves/ Squires/
Watson)

Monday 27 July

Cinner, Joshua & Shankar Aswani, 2007. Integrating customary management into marine conservation. *Biological Conservation*. 140; 201-216

Cinner, Joshua, 2005. Socioeconomic factors influencing customary marine tenure in the Indo-Pacific. *Ecology and Society*; 10(1):36

Baland, Jean-Marie & Platteau, Jean-Phillipe. 2000 *Halting Degradation of Natural Resources: Is there a Role for Rural Communities?* Oxford University Press. Chapter 12

Ferraro, Paul & Kiss, Agnes, 2002, Direct Payments to Conserve Biodiversity, *Science* 29 November 2002 298: 1718-1719

Tuesday and Wednesday, 28 & 29 July

Dixit, A. 2004. Lawlessness and Economics: Alternative Modes of Governance. Princeton Univ. Press (Distributed pages)

Gibbons, R. 1997. An Introduction to Applicable Game Theory. *The Journal of Economic Perspectives* 11:127-149

Wednesday 29 July

Barrett, Scott. 2003. Environment & Statecraft: The Strategy of Environmental Treaty-Making. Oxford, Chapter 2: 19-48 & Chapter 8: 221-253

Stern Review: The Economics of Climate Change (2006): Executive Summary: 1-27

Nordhaus, W. 2006. The Stern Review on the Economics of Climate Change: 1-21

Dasgupta, P. 2006. Comments on the Stern Review's Economics of Climate Change: 1-9

Lomborg, B. (undated), Global Warming – are we doing the right thing? 1-6

Stokey, N. 2005. Giving Aid Effectively, Federal Reserve Bank of Minneapolis – The Region – 2005 Annual Report: 1-16

Thursday 30 July

California EPA, June 2007. "Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California - Recommendations of the Market Advisory Committee to the Calif. Air Resources Board," Chapters 1 – 4 (remaining chapters optional).

WEEK 7**AUGUST 3 – 7****GOVERNANCE, LAW, & POLICY**

Lecturers: Kathryn Mengerink, mengerink@eli.org, x 25821
 Steve Roady, sroady@earthjustice.org
 Erica Feller, TNC, efeller@tnc.org
 Kate Wing, Moore Foundation
 John Hocevar, Greenpeace, jhocevar@greenpeace.org
 James Ianelli, NOAA Alaska Fisheries Science Center, jim.ianelli@noaa.gov
 Brad Ack, Marine Stewardship Council, brad.ack@msc.org (tentative)

Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

PROJECT REPORT III DUE – ECONOMICS AND CLIMATE CHANGE

Monday 3 Aug Ocean and Coastal Law and Policy Overview
 09:00 - 10:20 Introduction to governance week (Mengerink)
 Ocean and Coastal Law and Policy Overview (Mengerink)
 10:40 - 12:00 Moving toward Marine Spatial Planning and Management
 Current Approaches (Wing)
 Expanding the Public Trust Doctrine (Roady)

LUNCH BREAK
 13:00 – 15:00 Welcome to the Hill
 Your assignment (Feller & Wing)
 Group breakout for hearing planning

Tuesday 4 Aug Exploring Legal Approaches: Fisheries and Energy Case Studies
 09:00 - 10:20 Lecture/Discussion: Fisheries: MSA (Roady, Feller & Wing)
 10:40 - 12:00 Lecture/Discussion: Fisheries: NRDC v Daley (Roady, Feller, & Wing)
 LUNCH BREAK
 13:00 – 14:00 Lecture/Discussion: Energy Development: Cape Wind (Roady & Wing)

14:00 – 15:00 Lecture/Discussion: Energy Development: Massachusetts Oceans Act (Wing and Mengerink)
 Discussion: Constituent Concerns (Feller & Wing)
 15:10 – 16:00 Hearing Updates

Wed 5 Aug In the Trenches with Marine Spatial Planning
 09:00 - 10:20 Lecture/Discussion: Existing Federal Framework: OCSLA, Federal Power Act, NMSA (Mengerink)
 10:40 - 12:00 Discussion: Marine Spatial Planning
 LUNCH BREAK
 13:00 – 14:20 Hearing Updates (Feller & Wing)
 14:40 – 16:00 Prepare for hearing

Thursday 6 Aug Mock Senate Panel presentations
 09:00 – 10:20 Senators and staff work out statements and witness questions
 10:40 – 12:00 Hearing
 LUNCH BREAK
 13:00 – 14:20 Media Interviews
 14:40 – 16:00 Discussion (Feller & Wing)

Friday 7 Aug The Pollock Fishery: Combining Science, Management, and Market-Based Strategies
 09:00 – 10:20 Pollock stock assessment and trends (Ianelli)
 10:40 – 12:00 Marine Stewardship Council (Ack)
 LUNCH BREAK
 13:00 – 14:20 Conservation considerations (Hocevar)
 14:40 – 16:00 Panel Discussion

Monday 3 AugREAD:

- Sivas, Debbie. A primer for non-lawyers on readings and understanding legal concepts and documents. pp 1-5
- US Commission Report, Chapter 2 - "Understanding the Past to Shape a New National Ocean Policy" (2004) pp 19 – 30.
- Turnipseed, M., L.B. Crowder, R. Sagarin, and S.E. Rody (2009) Legal bedrock for rebuilding America's ocean ecosystems. *Science* 324: 183–84.
- Crowder et al. Resolving Mismatches in US Ocean Governance, 313 *Science* 617 (2006).
- Fanny Douvere & Charles Ehler, The Role of Marine Spatial Planning in Implementing Ecosystem-based, Sea Use Management, 32 *Marine Policy* 759 (2008).

REFERENCES:

- Take a look at the ocean commission site: (www.oceancommission.gov) and the Pew Commission work (http://www.pewtrusts.org/our_work_detail.aspx?id=130)

Tuesday 4 AugREAD:

- Richard Wallace & Kristen Fletcher, *Understanding Fisheries Management: A Manual for understanding the Federal Fisheries Management Process, Including Analysis of the 1996 Sustainable Fisheries Act*, pp 1-31.
- *NRDC v Daley*, 209 f3rd 747 DC Cir 2000.
- Massachusetts Oceans Act (Chapter 114 of the Acts of 2008)
- Look at the Mass Ocean Management Initiative Website (<http://www.mass.gov/czm/oceanmanagement/index.htm>)

REFERENCES:

- Pew Oceans Commission Report: *Managing Marine Fisheries in the United States* (2003) pp 1-80.
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006.
- *Alliance to Protect Nantucket Sound v. United States Department of the Army Corps of Engineers*, 398 F. 3rd 105 (1st Cir. 2005) (case limited to granting a permit for construction of a pre-wind farm offshore temporary data tower);
- *Alliance to Protect Nantucket Sound, Inc. v. Energy Facility Siting Board*, 858 N.E. 2nd 294 (Mass. 2006) (case focuses on necessary coordination between inconsistent federal and state permitting procedures).

Wednesday 5 Aug

- No assigned reading.

Thursday 6 Aug

- No assigned reading.

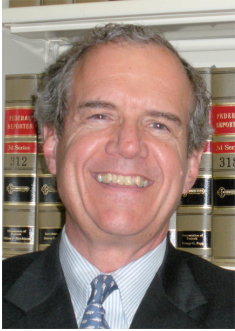
Friday 7 Aug

READ: TBA

REFERENCES: TBA

GOVERNANCE, LAW AND POLICY

August 3 & 4



Steve Roady is an environmental lawyer at Earthjustice (formerly the Sierra Club Legal Defense Fund) who has pioneered litigation to preserve ocean resources and has also litigated precedent-setting cases that protect water resources and improve the nation's air quality. Most recently, he has been pursuing cases designed to protect the Gulf of Mexico, and to prevent the mountains and streams of southern West Virginia from being destroyed by mountaintop removal coal mining.

Mr. Roady's experience covers a wide range of issues. During 1998-2000, Mr. Roady was the director of the Ocean Law Project, an initiative designed to conserve ocean resources, including fisheries, marine mammals, sea turtles, and ocean ecosystems. The Ocean Law Project employed litigation and negotiation to ensure that the United States government properly conserves these resources.

During 2001 and 2002, Mr. Roady was the first president of Oceana, a non-profit international ocean conservation organization dedicated to protecting life in the sea through public education, advocacy, communications, science, and litigation.

Mr. Roady graduated with honors from Davidson College in 1971, and received his law degree from Duke University in 1976. He teaches environmental litigation both at Duke and at American University. In addition, he teaches ocean and coastal law and policy at Duke. He serves on the Board of Visitors at Duke's Nicholas School of the Environment. Harvard Law School has named him a Wasserstein Public Interest Fellow for 2007-2008.

August 3-6



Erika Feller has been a Marine Project Director for The Nature Conservancy's California Coastal and Marine Program since June 2007. She helps lead development of TNC's fisheries work in the Central Coast where TNC is working to catalyze a change in the industry to more sustainable harvest practices in order to protect rich biodiversity and ocean habitats off California's central coast and leads work with the public sector to support the Conservancy's marine conservation projects and policies. Prior to joining the California program she served as the Senior Policy Advisor for NOAA at The Nature Conservancy's Worldwide Office where she represented the Conservancy's interests regarding federal coastal and marine policy and funding with Congress and the

Administration.

Prior to joining the Conservancy in 2000, she was Senior Legislative Assistant for Environment and Natural Resources for Congressman Wayne T. Gilchrest where she worked on a wide range of coastal and marine issues. She was a Dean John A. Knauss Sea Grant Marine Policy Fellow in 1995. She received a M.S. in Natural Resource Economics from the University of Alaska Fairbanks and a B.A. in Economics from Saint Mary's College of Maryland.

August 3 – 6



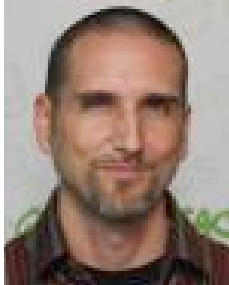
Kate Wing is a senior program officer in the Marine Conservation Initiative. Prior to joining the Foundation she was an independent ocean policy and communications consultant working with fishing and conservation organizations. During her eight years with Natural Resources Defense Council (NRDC) she focused on the creation of marine protected areas, developed state legislative and budget conservation priorities, and participated in the development of several fishery management plans, including the Pacific Council's HMS FMP and California's abalone management and recovery plan. Kate's academic

background is in marine biology, including a season in Antarctica.

She holds a master's degree from the University of Washington's School of Marine Affairs and served as a Knauss Sea Grant Fellow on the Senate Commerce Committee.

August 7

John Hocevar is the Director of Greenpeace USA's oceans program. He has led two scientific expeditions to the Bering Sea, confronted factory fishing in Chesapeake Bay, and coordinated the UN lobbying efforts for the Deep Sea Conservation Coalition. He has led Greenpeace USA's efforts to end commercial whaling, stop overfishing, and establish a global network of marine reserves, working with scientists, policy makers, and business leaders. Hocevar has worked on *in situ* research projects in New England, Florida, Alaska, and throughout the Caribbean. He earned a Masters in Marine Biology from Nova Southeastern University, and received his undergraduate degree in evolutionary ecology at the University of Connecticut.



August 7

James Ianelli has been active in fisheries research for over 27 years. Early in his career, he worked as a field biologist holding a number of unique positions including investigations on tuna biology and fisheries, Dungeness crabs, flying fish, trochus (very large sea snails), and statistical data collection problems for small-scale reef fisheries. James served as a research scientist with the South Pacific Commission, New Caledonia, and was Lab Director for the Inter-American Tropical Tuna Commission's (IATTC) facility in Panama. For the last 16 years, James has been an active member of Alaska Fisheries Science Center's stock assessment team and authored numerous analytical documents applied to the management of important groundfish species in the North Pacific. James'



research includes developing statistical approaches for ecosystem/fisheries conservation management as well as international projects, for example tagging experiments on juvenile bluefin tuna in small fishing villages of Japan.

James has a BS from Humboldt State University, and a PhD (1993) from University of Washington on the population dynamics of skipjack tuna. He is an affiliate faculty member at the University of Washington and serves as an editor for the journal 'Natural Resource Modeling'. James is Chair of the North Pacific Fishery Management Council's 'Gulf of Alaska Groundfish Plan Team', and is a member of the Advisory Panel for the 'Commission for the Conservation of Southern Bluefin Tuna'.

August 7

Brad Ack is Regional Director for the Marine Stewardship Council. (tentative)

WEEK 8 **AUGUST 10 - 14** **COMMUNICATIONS I and ETHICS**

Instructors: Chris Mooney, moonecc@gmail.com
Sheril Kirshenbaum, sheril.kirshenbaum@gmail.com
K.C. Cole, kccole@usc.edu
Jennifer Ouellette – JenLuc@gmail.com
Mark Dowie, dowie@earthlink.net
Tom Bowman, Bowman Climate Change
Craig Callender , UCSD, ccallender@ucsd.edu, 858-822-4911
Jay Odenbaugh, Lewis and Clark College, jay@lclark.edu
Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

Monday 10 Aug Science communication: History, Theory, Practice, and Economics
09:00 – 10:20 Lecture (Mooney) From Copernicus to Stephen Colbert: A Brief History of Communications

10:40 – 11:10 Lecture (Kirshenbaum) Adventures in Ocean Science Communications
11:10 - 12:00 Lecture (Bowman)
LUNCH BREAK
13:00 – 14:20 Lectures (Cole and Dowie) The Death of Science Journalism
14:40 – 16:00 Student Discussion (Cole, Dowie, Mooney) Traditional Communications

Tuesday 11 Aug Science Communications II: New and Untraditional Media
09:00 – 10:20 Lecture (Ouellette) Science in Entertainment
10:40 – 12:00 Lecture (Mooney, Kirshenbaum) I Am New Media, and So Can You!
LUNCH BREAK
13:00 – 14:20 Interactive Session (Mooney, Kirshenbaum) – Live Communications training
14:40 – 16:00 Interactive Session (Mooney, Kirshenbaum) Live Communications training

Wednesday 12 Aug
09:00 - 10:20 Lecture (Callender/Odenbaugh) Introduction to Ethics
10:40 - 12:00 Lecture/Discussion (Odenbaugh/Callender) When Ethics Goes Wild
LUNCH BREAK
13:00 – 14:20 Lecture (Callender/Odenbaugh) Case Study: Future Generations & Climate Change
14:20 – 16:00 Discussion

Thursday 13 Aug
09:00 - 10:20 Lecture (Odenbaugh) Exotic Species and Environmental Value
10:40 - 12:00 Lecture (Odenbaugh/Callender) Assisted Migration and Rewilding
LUNCH BREAK
13:00 – 14:20 Discussion (Odenbaugh/Callender) Assisted Migration and Rewilding
14:40 – 16:00 Lecture (Callender) Pluses and Minuses of Cost Benefit Analysis

Friday 14 Aug
09:00 - 10:20 Lecture (Callender) Politics, Science and Ethics
10:40 - 12:00 Discussion (Callender/Odenbaugh)
LUNCH BREAK
13:00 – 14:20 Discussion (Odenbaugh)

WEEK 8**AUGUST 10 - 14****READINGS AND ASSIGNMENTS**Monday 10 Aug

The Marquis de Condorcet, 1795, *Sketch for a Historical Picture of the Progress of the Human Mind*, London: Weidenfeld and Nicolson, 1955. Introduction & "The Eighth Stage: From the invention of printing to the time when philosophy and the sciences shook off the yoke of authority," p. vii-xii and 99-123.

Mooney & Kirshenbaum: *Unscientific America: How Scientific Illiteracy Threatens Our Future*, New York: Basic Books, 2009. Chapter 6: "Unpopular Science."

K.C. Cole, "Weird Science," *Columbia Journalism Review*, May/June 2006.

Assignment:

1. Blog a response to one of today's lectures at "The Intersection", <http://blogs.discovermagazine.com/intersection/>, after posts about the lectures go up.
2. Prepare a "communication triangle" as discussed in class, designed to help you communicate a scientific topic with which you're familiar to a broader audience through the media.

Tuesday 11 Aug

Mooney & Kirshenbaum: *Unscientific America: How Scientific Illiteracy Threatens Our Future*, New York: Basic Books, 2009. Chapter 7: "Hollywood and the Mad Scientists."

Mooney & Kirshenbaum: *Unscientific America: How Scientific Illiteracy Threatens Our Future*, New York: Basic Books, 2009. Chapter 9: "The Bloggers Cannot Save Us."

Assignment:

1. Blog a second response to one of today's lectures at "The Intersection", <http://blogs.discovermagazine.com/intersection/>, after posts about the lectures go up.

Wed 12 Aug

Fieser, James. "Ethics" from the Internet Encyclopedia of Philosophy. 1-14

Sober, Elliot. 1995. 'Philosophical Problems for Environmentalism' in *Environmental Ethics*, edited by Robert Elliot, Oxford, 1995. 1-13

Gardiner, Stephen. 2004. Ethics and Global Climate Change. *Ethics* 114:555-600

Hausman, Daniel M. and Michael S. McPherson, "Beware of Economist Bearing Advice" published in *Policy Options* 18, no. 7 (September, 1997): 16-19.

Thurs 13 Aug

Justus, J. "Exotic Species" in *Encyclopedia of Environmental Ethics and Philosophy*, Callicott, J.B. and R. Frodeman (eds.). Thomas Gale: 2008. 412-414.

"Aliens Among Us," A round table with James H. Brown and Dov F. Sax, Daniel Simberloff, and Mark Sagoff, *Conservation Magazine*, April-June 2007 (Vol. 8, No. 2)

Mark Woods and Paul Moriarty (2001) "Strangers in a Strange Land: The Problem of Exotic Species," *Environmental Values* 10: 163-191.

Fox, Douglas. 2007. When Worlds Collide. *Conservation* Vol. 8, No. 1

Donlan, C. Josh. 2007. Restoring America's Big, Wild Animals, *Scientific American* 70-77.

Sunstein, Cass R. 2005. Cost-Benefit Analysis and the Environment. *Ethics* 115: 351-385

Fri 14 Aug

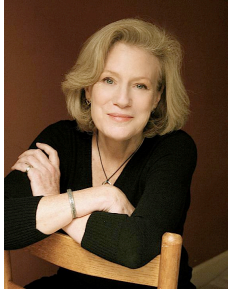
Shrader-Frechette, *Taking Action, Saving Lives*, chapter 1,2.

Kellert, Stephen R., *Human Values, Ethics, and the Marine Environment*. In Dallmeyer, D.G. (editor). 2003. *Values at Sea: Ethics for the Marine Environment*. 1-18. University of Georgia Press, Athens, GA, USA

Oreskes, Naomi. 2004. Science and Public Policy: What's Proof Got to Do with It? *Environmental Science & Policy* 7:369-383.

August 10

K.C. Cole, a long-time science writer for the Los Angeles Times, is currently a professor at USC's



Annenberg School of Journalism. Once described by Amazon.com as "the Leonardo da Vinci of science writing," she is the author of eight nonfiction books, most recently *Something Incredibly Wonderful Happens: Frank Oppenheimer and the World He Made Up*—a memoir/biography of her late mentor, the self-proclaimed "uncle" of the atomic bomb and founder of San Francisco's world-renowned "museum of awareness," the Exploratorium. Her other books include *The Universe and the Teacup: The Mathematics of Truth and Beauty*—a national best-seller translated in a dozen languages—and *Mind Over Matter: Conversations with the Cosmos*, based on her LA Times columns. Cole's writing has appeared in *The New Yorker*, *The New York Times*, *The Smithsonian*, *The Columbia Journalism Review*, *Newsweek*, *Esquire*, *Ms.*, *The Washington Post* and many other

publications, and her work was featured in *The Best American Science Writing* 2004 and 2005, and *The Best American Science and Nature Writing* 2002. Among her most treasured awards are the American Institute of Physics prize for science writing, the Los Angeles Times award for Explanatory Journalism, the Edward R. Murrow Award for "thoughtful coverage of scientific controversies" from the Skeptics Society, and the Exploratorium's public understanding of science award, presented by Frank Oppenheimer the year before his death. Believing with the late artist Bob Miller that the worst disease afflicting humankind is "hardening of the categories," Cole likes to play with the natural connections between science, art, politics, whatnot, and hosts an irregular series of events exploring these intersections at Santa Monica Art Studios known as *Categorically Not!* She's also a year-end commentator for NPR's *Science Friday* and BBC's *World Service*. Before coming to USC, she developed and taught courses on science writing and culture at Yale, Wesleyan and UCLA.

August 10



Mark Dowie is one of the nation's foremost investigative journalists. He has won 17 major awards including four National Magazine awards. His award-winning articles include: "Pinto Madness" (first report on the Ford Pinto's explosive gas tank), "A Case of Corporate Malpractice" (the Dalkon Shield interuterine device), "The Illusion of Safety" (a series on unsafe products and chemicals), "The Corporate Crime of the Century" (export of banned and hazardous products to undeveloped countries), "Redwood Summer" (environmental confrontation with logging industry), "The Rothschild Years" (\$39 million purloined while SEC looked the other way), and "The War for the West" (militia movement). Dowie is also the author of

"*Losing Ground: American Environmentalism at the Close of the Twentieth Century*" (MIT Press, 1995), which was nominated for a Pulitzer Prize "American Foundations: An Investigative History and has just completed "Refugees From Conservation: Global Conservation's 100 Year Misunderstanding with Native Peoples" (MIT Press 2008). Spring semesters he teaches science and foreign correspondence at UC Berkeley's Graduate School of Journalism.

August 10 & 11

Sheril Kirshenbaum is an associate at Duke University and co-author of the forthcoming book,



Unscientific America: How Scientific Illiteracy Threatens Our Future, with Chris Mooney. She is involved in conservation initiatives across levels of government and works to improve communication between scientists, policymakers, and the public.

In 2007, Sheril helped to found *Science Debate 2008*; an initiative encouraging candidates to debate science research and innovation issues on the campaign trail. She has also worked as a legislative science fellow on Capitol Hill with Senator Bill Nelson (D-FL) where she was involved in energy, climate, and ocean policy.

Sheril holds two MS degrees in Marine Biology and Marine Policy from the University of Maine. Now a science journalist, she frequently writes about topics

that bridge science and society from climate change to the science behind kissing. Previously, she served as a Fellow with the Center for Biodiversity and Conservation at the American Museum of Natural History and as a Howard Hughes Research Fellow at Tufts University. She has contributed reports to The Nature Conservancy and provided assistance on international protected area projects. She also has experience working in pop radio and her work has been published in *Fisheries Bulletin*, *Oecologia*, *Issues in Science and Technology*, and *Science*. Sheril Kirshenbaum co-hosts The Intersection on Discover blogs with Chris Mooney and contributes to DeSmogBlog, Talking Science, and Wired Science's Correlations. She was born in Suffern, New York and is also a musician.

August 11

Jennifer Ouellette

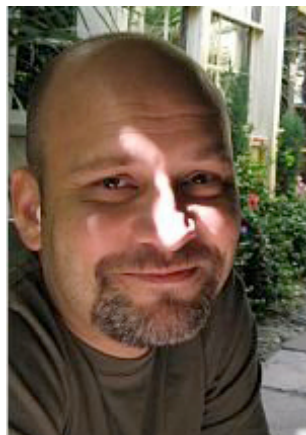


Jennifer Ouellette is the director of the Science and Entertainment Exchange, a program of the National Academy of Sciences designed to foster creative collaboration between scientists and the entertainment industry. She is the author of two popular science books for the general public: *The Physics of the Buffyverse* (2007) and *Black Bodies and Quantum Cats: Tales from the Annals of Physics* (2006), and is now writing her third book for Penguin, *Dangerous Curves: How I Learned to Stop Worrying and Love the Calculus*. A card-carrying member of the Authors Guild and National Association of Science Writers, her work has appeared in *Discover*, *Salon*, *Nature*, *Physics*

Today, *Symmetry*, *Physics World*, and *New Scientist*. She maintains a general science-and-culture group blog called *Cocktail Party Physics*, and writes the *Twisted Physics* blog for *Discovery News*. Ouellette has also worked extensively in education and outreach efforts with nonprofit science organizations, including the American Physical Society and the American Institute of Physics. She holds a black belt in jujitsu, and has been known to draw upon that expertise from time to time to demonstrate the fundamentals of Newtonian mechanics to the general public.

August 12 – 14

Jay Odenbaugh is a member of the Department of Philosophy and the Environmental Studies Program at Lewis and Clark College. His main areas of research are in the philosophy of environmental sciences (especially ecology) and environmental ethics.



Much of his research has focused on foundational issues in the science of ecology especially the role of modeling. He is also concerned with how theories and models are used in general environmental decision-making. Another area of his research concerns the nature of communities and ecosystems. A third area of research concerns the nature and appropriate role of values in the environmental sciences.

He is currently working on a book tentatively entitled *On the Contrary: A Philosophical Examination of the Environmental Sciences and their Critics* examining these issues (and many others) especially in ecology, climatology, and environmental economics.

WEEK 9**AUGUST 17 - 21****NGOs & COMMUNICATIONS II**

Instructors: Jennifer Palmer, IUCN, jpalmer@iucn.org
Randy Olson, Prairie Starfish Productions, rolson@usc.edu
Tamara Olson, internet strategies

Course Assistants: Kristen Marhaver, x44897, kmarhaver@ucsd.edu
Ivan Rosero, irosoero@ucsd.edu

Mon 17 August Morning off (work on final project)
15:00 - 16:00 Lecture (Palmer): IUCN an introduction

Tues 18 August
09:00 - 10:20 Lecture (Palmer): IUCN Marine Program
10:40 - 12:00 Discussion/Group exercise (Palmer) –TED Prize activities
LUNCH BREAK
13:00 - 14:20 Exercise and Discussion (Palmer)
14:40 - 16:00 Discussion: Internships and career opportunities

Wed 19 August Communications II -
09:00 - 10:20 Lecture (Olson, T): Internet and Branding
10:40 - 12:00 Lecture (Olson, T): Web Design
LUNCH BREAK All students turn in one-page "Interview Pitch"
13:30 - 14:40 Presentation (Olson, R.): Story telling
14:40 - 15:00 BREAK
15:00 - 16:00 Interview Pitch/Vote

Thurs 20 August Production - MEDIA TEACHING CENTER UCSD
09:00 - 10:00 Tutorial (Olson) Camera Operation
10:20 - 12:00 Tutorial (Olson) Editing film
LUNCH BREAK
13:00 - 15:00 Student Film interviews
15:00 - 17:00 Begin Editing
HOMEWORK Internet strategy / Editing Films

Friday 21 August: Editing - MEDIA TEACHING CENTER UCSD
09:00 - 12:00 Exercise: Editing films
LUNCH BREAK
13:00 - 16:00 Exercise: Complete Film Production & Internet Strategy
16:00 - 17:00 Set up for screening RETURN TO SIO
17:00 - 19:00 Screen films/Present strategy/Happy Hour

Monday 17 August

No readings assigned

Tuesday 18 August

No readings assigned

Wed 19 August

Dawkins, Richard. 1999. Memes: The New Replicators. Chapter 11 from his book The Selfish Gene pp 1-18. <http://www.rubinghscience.org/memetics/dawkinsmemes.html>

McLuhan, Marshall. Media: Hot and Cold", (chapter 2 of his book Understanding Media) pp 1-8. http://www.georgetown.edu/faculty/irvinem/theory/McLuhan-Understanding_Media-I-1-7.html

Trippi, Joe. 2004. "The Revolution Will Not Be Televised" pp 1- 13. <http://www.msnbc.msn.com/id/5353944/>

Rosen, Jay. "The Net Knows More Than You Do: An Open Letter to the People of CBS News" pp 1-5 http://journalism.nyu.edu/pubzone/weblogs/pressthink/2005/09/16/opn_ltr.html

Rosenblatt, Gideon. 2004. "Movement as Network: Connecting People and Organizations in the Environmental Movement" Report by Organizations in the Environmental Movement. pp 1-17.

Thurs 20 August,

Auletta, Ken. 2005. Do ads still work? The New Yorker. Pp 1-11 http://www.newyorker.com/archive/2005/03/28/050328fa_fact

Klosterman, Chuck. 2005. The Drowsy Dozen. Esquire. Pp 1-4 http://www.esquire.com/features/ESQ0106KLOSTERMAN_64

Michael Caine on Acting (NOTE only available on the web) http://www.youtube.com/watch?v=yHfz7_YjRww

della Cava, Marco R. 2008. Today's Internet market: Amid rush to sign online talent, agencies ponder how to profit. USA Today. Pp 1-6. http://www.usatoday.com/life/2008-05-30-online-talent-scouts_N.htm

Miller, M. 2005. Is persuasion dead? New York Times, Saturday June 4, page a-29

Dean, C. 2003. Rousing Science Out of the Lab and Into the Limelight. The New York Times. Late Edition, East Coast. New York, N.Y.: Nov 11, 2003. pg. F.10

August 17 & 18

Jennifer Palmer has worked as a marine conservation scientist and educator for the past 10 years. She aims to reach new constituencies with a positive conservation message in order to grow collaborative networks from diverse regions, backgrounds and cultures around the world.



She received her master's degree in Applied Ecology and Conservation from the University of East Anglia (England) with a focus on community-based conservation and education as a tool to reduce poaching of endangered sea turtles in Costa Rica. Through a myriad of ocean projects, she has worked with non-profit, government and private sectors such as the Marine Conservation Biology Institute, Monterey Bay Aquarium, Sea Mammal Research Unit, Environmental Media Fund, Ocean Institute, and National Marine Fisheries Service.

She also has extensive field experience and has researched endangered Hawaiian monk seals, albatross and green sea turtles while living on one of the worlds most remote coral atoll chains, now know as the Papahānaumokuākea Marine National Monument. During this time she assisted national Geographic's CRITTERCAM series and Jean-Michel Cousteau's PBS series Voyage to Kure. Prior to Hawaii, she joined Ocean Alliance's R/V Odyssey expedition, a five-year scientific voyage to study the health of the world's oceans. Through this experience, she sailed across the Pacific Ocean collaborating with cultures across Baja, Galapagos Islands, Marquesas, Republic of Kiribati, Papua New Guinea and Australia.

August 19**Tamara Olson**

Tamara Olson is a Web information architect/user experience designer. She most recently served as Lead User Experience Architect for the redesign of The New York Observer's Observer.com, which received a 2009 Best Newspaper Webby nomination and an EPPY award nomination. Tamara received her Master's from NYU's Interactive Telecommunications Program, during which time she built her thesis Wanderlust, a social networking website for backpackers. Between years at NYU, she spent the summer working at Apple in Cupertino, California designing pages for <<http://apple.com>>apple.com. She has also spent time working as an interactive consultant at Corebrand (a Manhattan brand strategy firm) and teaching elementary school children in Bedford-Stuyvesant. Someday, she hopes to re-focus her endeavors on

inventing effective ways to integrate technology into public schools. Tamara currently lives in New York City. When she is not designing and building websites, she spends her time running, studying voice, and daydreaming about her next trip.

August 19, 20 & 21

Randy Olson is the typical former tenured biology professor who moved to Hollywood to make comedy science movies (you know the type). Once upon a time he had a Ph.D. in biology (Harvard, 1984) and studied starfish larvae. Today he is preparing for the release of his first book, "Don't Be



Such A Scientist: Talking Substance in an age of style," to be published by Island Press in September, 2009. The book encapsulates his 20 year journey from the world of academic science (he left a tenured professorship in marine biology at the University of New Hampshire) to writer/director of the acclaimed feature documentaries, "Flock of Dodos: The Evolution-Intelligent Design Circus," (Tribeca '06, Showtime '07) and "Sizzle: A Global Warming Comedy" (Outfest '08). In addition, for the past seven years he has

been co-founder and Director of the Shifting Baselines Ocean Media Project (<http://www.shiftingbaselines.org>) with Dr. Jeremy Jackson of Scripps Institution of Oceanography.

WEEK 10**AUGUST 24 – 27****FINAL PROJECT**

Instructor: Jeremy Jackson, 22432, jbjackson@ucsd.edu
Course Assistant: Kristen Marhaver, x44897, kmarhaver@ucsd.edu

Monday 24 August WORK ON FINAL PROJECT

Tuesday 25 August WORK ON FINAL PROJECT

Wed 26 August WORK ON FINAL PROJECT

Thursday 27 August WORK ON PROJECT
17:00 TURN IN FINAL PROJECT – GRANT PROPOSAL OR CONCEPT PAPER
17:00 - 20:00 CLASS PARTY - CUPS

Friday 28 August MAS STUDENTS ONLY
10:00 – 12:00 Advising (Norris, Chapman, Weinzeril)

Introduction to Marine Biodiversity and Conservation
SIO295 & SIO 295L

Field Trips and Special Events

Friday 19 June 17:00 - 19:00 Welcome Reception TG Surfside/Forum
Hosted by CMBC and IGERT Students

Friday 26 June 13:00 - 15:00 Field Trip - Hastings
Birch Aquarium at Scripps - Meet at the Education Office at the aquarium

Thursday 2 July 7:45 - 13:00 Field Trip - Leichter
Coastal landscapes, coastal cities and coastal problems - Tijuana Estuary
Assemble at 7:45 a.m. You may or may not be hot thirsty, sunburned, wet and muddy. Be prepared.
Sunscreen, a hat, long sleeve shirt and long pants are best. Flip flops are discouraged and old tennis shoes that can get wet and muddy are best.

Friday 3 July HOLIDAY

Saturday 11 July 07:00 - 18:30 All Day at Sea on the Sproul
(Norris, Rouse, Jackson)
Assemble outside SIO Library at 6:45 a.m.
Parking at the Nimitz facility is limited. All participants are expected to use the transportation provided and scheduled to depart SIO at 7:00 a.m.
Pick up from Nimitz is scheduled for 6:00 p.m.
CLOSED-TOE SHOES REQUIRED - You will not be allowed onboard without them!
Please bring with you government issued photo ID.
Be prepared to be hot, wet, thirsty and sea sick. Please take appropriate precautions.

Thursday 15 July 9:00 - 12:00 Field Trip - Norris
Torrey Pines coastal geology (beach walk - handout in class binder)
Assemble at 8:45

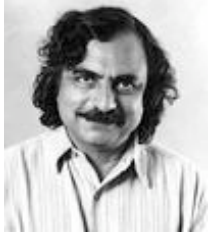
Saturday 18 July 07:00 - 18:30 All Day at Sea on the Sproul
(Norris, Rouse, Jackson)
Assemble outside SIO Library at 6:45 a.m.
Parking at the Nimitz facility is limited.
All participants are expected to use the transportation provided and scheduled to depart SIO at 7:00 a.m.
Pick up from Nimitz is scheduled for 6:00 p.m.
CLOSED-TOE SHOES REQUIRED - You will not be allowed onboard without them!
Please bring with you government issued photo ID.
Be prepared to be hot, wet, thirsty and sea sick. Please take appropriate precautions.

Friday 21 August 16:00- 18:00 Film screening and happy hour - 4500 Hubbs Hall

Thursday 27 August 17:00 - 20:00 Class Party: CUPS

SIO295 & SIO295 L - 2009 Participating Faculty and Researchers

Jeremy Jackson (Course Coordinator) Professor of Oceanography, Scripps Institution of Oceanography and Smithsonian Tropical Research Institute. 304 Vaughan Hall, 858-822-2432, jbjackson@ucsd.edu, Research interest: Paleobiology and macroevolution; speciation and extinction; ecology and paleoecology of coral reefs



Farooq Azam - Professor, Marine Biology Research Division, 4105 Hubbs Hall, 858-534-6850, fazam@ucsd.edu. Research Interest: Microbial oceanography; marine biogeochemistry; aquaculture microbiology; coral microbiology; biochemical adaptations of marine bacteria; role of bacteria in marine food-web dynamics

Julia Baum - Smith Conservation Research Postdoctoral Fellow, 2165 Hubbs Hall 858-822-5912 jkbaum@ucsd.edu
Research Interests: Marine Ecology, population dynamics



Ron Burton - Professor of Marine Biology, Director Marine Biology Research Division, Biology Section. 2140 Hubbs Hall, rburton@ucsd.edu, 858-822-25784
Research interest: Evolutionary biology and ecology; population genetics of marine organisms

Craig Callender - Professor, Philosophy & Ethics, 8077 H & SS, ccallender@ucsd.edu, 858-822-4911
Research interest: philosophy of physics, the metaphysics of science, and philosophy of science in general



Russ Chapman - Executive Director, CMBC, 1140 Hubbs Hall, rchapman@ucsd.edu, 858-822-1706
Research interest: Algal ultrastructure and phylogeny; biology of the Trentepohliaceae (Chlorophyta); ribosomal gene sequencing and molecular evolution in algae and bryophytes

Jeff Crooks - Southwest Wetlands Interpretive Association, Tijuana River National Estuarine Research Reserve
jacrooks@yahoo.com 619-575-3613



Paul Dayton - Professor of Oceanography, 332 Ritter Hall, pdayton@ucsd.edu, 858-534-6740
Research interest: benthic ecology, marine conservation and policy, evolution and natural history.

Andrew Dickson - Associate Professor, 203 Vaughan Hall, adickson@ucsd.edu, 858-822-2990
Research interest: marine inorganic chemistry, analytical chemistry of carbon dioxide in seawater.



Neal Driscoll - Professor- Geoscience, 307 Vaughan Hall, ndriscoll@ucsd.edu, 858-822-5026.
Research interests: Sea-level fluctuations, sedimentation and stratigraphy

Ted Groves - Professor microeconomic theory and regulation, Department of Economics, 317 Economics Bldg, tgroves@ucsd.edu, 858-534-2818
Research interest: Optimal design of organizations. Preservation of endangered marine animals and resources



Phil Hastings - Professor and Curator of Marine Vertebrates, 201 Vaughan Hall, phastings@ucsd.edu, 858-822-2913.
Research interest: systematics, morphological and molecular phylogenetics, life history and conservation of fishes, marine biogeography, evolution of behavior

Myrl Hendershott - Professor Oceanography, 303 CCS Bldg and 23 Old Scripps Bldg., mhendershott@ucsd.edu, 858-534-5705.
Research interest: large-scale ocean circulation



Charlie Kennel - 338 Nierenberg Hall, ckennel@ucsd.edu 858-822-6524
Research interest: global environmental science, the intersection of science and policy

Mark Jacobsen - Assistant Professor Economics, 223 Economics Bldg., 858-822-7767, m3jacobsen@ucsd.edu
Research interests: Economics of climate change, environmental policy instruments



Nancy Knowlton - founder CMBC, Adjunct Professor Marine Biology, Scripps Institution of Oceanography and Sant Chair, Smithsonian Institution. nknowlton@ucsd.edu, knowlton@si.edu
Research interest: ecology and evolution of coral reef organisms

Tony Koslow - Researcher, Director, CalCOFI, jkoslow@ucsd.edu, 858-534-7284
Research interests: Impacts of fisheries and deep-sea conservation, impacts of climate variability, seamount ecology.





Jim Leichter - Assistant Professor/Research, Integrated Oceanography, 328 Ritter Hall, jleichter@ucsd.edu, 858-822-5330.
Research interest: Ecological consequences of oceanographic forcing mechanisms in coastal habitats; roles of environmental variability in structuring benthic marine communities

Lisa Levin - Professor of Oceanography , Llevin@ucsd.edu, 858-534-3579, 2236 Sverdrup Hall
Research interest: Invertebrate and fish life histories, dispersal, demography, and evolution; community ecology of soft-bottom assemblages in deep-sea and intertidal habitats; animal-sediment interactions; ecology of methane seeps; biodiversity of sediment ecosystems



Kathryn Mengerink - Director of the Ocean Programs, Environmental Law Institute, 2000 L Street, NW, Suite 620, Washington, DC 20036
<http://www2.eli.org/ocean/index.htm>, mengerink@eli.org, 3430 Hubbs Hall, 858-822-5821
Research interest: law and policy options to conserve and protect the marine environment

Richard Norris - Professor Geoscience, 309 Vaughan Hall, rnorris@ucsd.edu, 858-822-1868
Research interest: Paleoceanography -role of plankton evolution in biogeochemical cycles; structure and dynamics of large-scale diversification in the history of life



Naomi Oreskes - Professor of History and Science Studies, 6086A H&SS, 858-534-4695
Research interest: historical development of scientific knowledge, methods, and practices in the earth and environmental sciences, and understanding scientific consensus and dissent

William Perrin - NOAA SWFSC, William.Perrin@noaa.gov, 858-546-7096
Research interest: systematics and ecology of cetaceans



Greg Rouse - Professor/Curator Benthic Invertebrates, 2170 Hubbs Hall, grouse@ucsd.edu, 858-534-7973
Research interest: phylogeny and systematics of marine animals, evolution of life history strategies in marine animals

Stuart Sandin - Research Scientist, Marine Biology, 4150 Hubbs Hall, ssandin@ucsd.edu, 858-534-4150
Research interest: Marine community ecology and conservation





Lisa Shaffer – Executive Director UCSD, Environment and Sustainability Initiative, 13314 Akinson Hall, lshaffer@ucsd.edu 858-822-2489
Research interest: Political science, public policy and sustainable development

Jennifer Smith – Professor, Marine Biology Research Division
2160 Hubbs Hall, jes013@ucsd.edu, 858-246-0803
Research Interest: benthic marine ecosystems



Dale Squires - Adjunct Professor natural resource economics. International Relations and Pacific Studies, UCSD Southwest Fisheries Science Center, NOAA Fisheries. Dale.squires@noaa.gov, 858-546-7113
Research interest: Fisheries Economics, Productivity, Regulation, Southeast Asia

Joel Watson – Professor, Department of Economics, 310 Economics Building, jwatson@ucsd.edu, 858-534-6132
Research Interest: Game theoretic models of contractual settings. Mechanism and institutional design. Renegotiation in bargaining



Additional CMBC faculty, scientists and advisors



Lisa Ballance - Leader, Ecosystems Studies Program, NOAA SWFSC. Chief Scientist, Eastern Tropical Pacific Cetacean and Ecosystem Research. Adjunct Professor, Biological Oceanography, Scripps Institution of Oceanography, lisa.ballance@noaa.gov, 858-546-7173
Research interest: Ecology and conservation of cetaceans and seabirds

Wolfgang (Wolf) Berger - Director, California Space Institute, Professor of Oceanography, wberger@ucsd.edu, 858-822-2545
Research interests: micropaleontology, marine sedimentation, ocean productivity, carbon cycle, ocean history, climate history, and history of oceanography.



Richard Carson - Professor of Economics, UCSD, 323 Economics Building, 858-822-2262
Research interest: Valuation methods for environmental goods. Identifying mechanisms to provide efficient levels of these goods. Natural Resource/Environmental Economics, Applied Economics, Econometrics

Jay Barlow - Research Scientist Southwest Fisheries Science Center, NOAA Fisheries, Adjunct Professors, Scripps Institution of Oceanography
jay.barlow@noaa.gov (858)546-7178
Research interest: Marine mammals and acoustics



Dave Checkley - Professor Integrated Oceanography, 2220 Sverdrup Hall, dcheckley@ucsd.edu, 858-534-4228
Research Interests: Ecology of marine zooplankton and fish, Effects of weather and air-sea interactions on plankton and fishes, Role of zooplankton in the marine nitrogen, Long-term change in pelagic zooplankton and fish

Tim Gerrodette - NOAA, SWFSC 858-546-7131
Research Interest: the assessment, management and conservation of marine life. A central part of assessment is a well-designed monitoring program that is able to detect changes in abundance over time. The Precautionary Principle gives guidance about how to manage in the face of uncertainty.





Clark Gibson - Professor of Political Science, 858-822-5140, ccgibson@ucsd.edu
 Research interest: politics of development, democracy and the environment

Josh Graff-Zivin - Associate Professor of Economics, IRPS, 1313 IRPS, 858-822-6438
 Research interest: economics – health, the environment and international development



Jeffrey Graham - Research Physiologist, Marine Biologist, Senior Lecturer, Center for Marine Biotechnology and Biomedicine, 310 Scholander Hall, jgraham@ucsd.edu, 858-534-8044
 Research interest: comparative physiology of fishes

Roger Hewitt - SWFSC, Fisheries Resources Division 858-546-5602
 Research Interest: Use of acoustics to conduct resource surveys; foraging tactics of whales, seals, penguins and other seabirds in relation to their prey; biological responses to climatic variability; resource management schemes that incorporate ecosystem considerations.



Rennie Holt, NOAA, SWFSC, Antarctic Ecosystem Research Division 858-546-5601
 Research interest: managing Antarctic marine living resources from an ecosystem perspective

Nigella Hillgarth - Executive Director Birch Aquarium at Scripps nhillgarth@ucsd.edu 858-822-4356
 Research interest: physiology and behavior of penguins, conservation of marine birds



Ralph Keeling - Professor, 312 Vaughan Hall, 858-534-7582
 Research interest: global carbon cycle; air-sea gas exchange, paleoclimate theory

Sarah Mesnick - Research Scientist, Southwest Fisheries Science Center, NOAA Fisheries. SWFSC liaison to CMBC & SIO, sarah.mesnick@noaa.gov, 858-546-7148
 Research interest: patterns of species diversity, conservation and management of endangered marine vertebrates, social and molecular ecology of marine mammal



Greg Mitchell - Research Biologist - Integrative Oceanography Division, gmitchell@ucsd.edu, 858-534-2687
 Research interest: Phytoplankton photosynthetic physiology and ecology, ocean optics and satellite remote sensing of phytoplankton biomass

Mark Ohman - Professor of Oceanography, 2153 Sverdrup Hall, mohman@ucsd.edu, 858-534-2754
Research interest: Long-Term Ecological Research in the California Current System; population ecology of marine zooplankton



Cheryl Peach - Academic Coordinator & Program Scientist, Birch Aquarium, cpeach@ucsd.edu, 858-822-5323

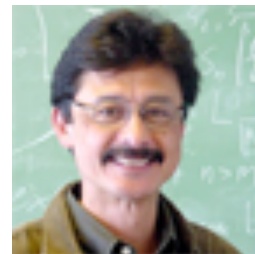
Research interest: education and public outreach

Jeff Severinghaus - Professor of Geosciences, jseveringhaus@ucsd.edu, 858-822-2483
Research interest: Mechanisms of millennial-scale climate oscillations, Pleistocene global carbon cycle



Karen Stocks - Research Scientist biogeography informatics. San Diego Supercomputer Center, 226 Sequoyah Hall kstocks@sdsc.edu, 858-534-5009
Research interest: biodiversity informatics, marine biogeography, seamount ecology

George Sugihara - Professor Ecological Modeling, 2120 Hubbs Hall, gsugihara@ucsd.edu, 858-534-5582
Research interest: food-web structure, species abundance patterns, market mechanisms for marine conservation, empirical climate modeling



Barbara Taylor - fisheries biologist, Southwest Fisheries Science Center - NOAA Fisheries. Barbara.Taylor@noaa.gov, 858-546-5620
Research interests: recovery factors for endangered marine mammals



Dolores Wesson - Scripps Institution of Oceanography, dwesson@ucsd.edu, 858-534-8041
Research interests: Natural resource management, science & environmental policy, international regimes, coastal conservation and sustainability



Junjie Zhang - Professor of Environmental Economics, 858-822-5733, junjiezhang@ucsd.edu
Research interests: environmental policy, natural resource economics and sustainable development



Graduate Students Participants



Kristen Marhaver - Lead Course Assistant, IGERT Fellow, kmarhaver@ucsd.edu, 3450 Hubbs Hall, x44897, Cell: 858-964-8258

Pincelli (Celli) Hull - IGERT Associate, phull@ucsd.edu, 2173 Sverdrup



Support Staff

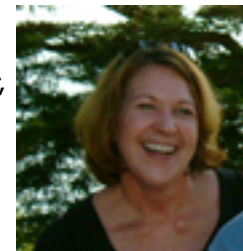
Amy Butros - Assistant Director, SIO Library
abutros@ucsd.edu, x23074

Penny Dockry - CMBC/IGERT Administrative Manager,
2155 Hubbs Hall, pdockry@ucsd.edu, x22790



Eddie Kisfaludy - Marine Technician
Marine Biology Research Division 2400 Hubbs Hall,
x44777

Jane Weinzierl - MBC-MAS Program Manager, UC
Extension, La Jolla Professional Center,
jweinzierl@ucsd.edu 964-1334, x22886
CMBC Study trailer student phone: x40568



**MAS/Ph.D. Students
2009-2010**

Joel Barkan (MAS)

I grew up on the coast of Maine, where I spent my summers tidepooling on the rocky shores and venturing into the Gulf of Maine on whale watching boats. My true passion has always been whales; I got my first whale research internship as a freshman in high school with Allied Whale in Bar Harbor, Maine, and haven't looked back. Throughout college, I came home to Maine for the summers to conduct humpback and fin whale photo-identification research for Allied Whale aboard commercial whale watching boats, as well as guiding whale watching tours as a naturalist.



I got my BA in Environmental Studies from Vassar College in Poughkeepsie, New York—a place with no whales, but a school where I began to look more closely at human impacts on the ocean. My senior thesis analyzed the effects of the Gulf of Maine's herring fishery on large whale abundance. I spent one of my undergraduate semesters participating in the Sea Education Association Sea Semester. With twenty other students, I sailed on a tall ship from Mexico to French Polynesia, with stops along the way in the Marquesas islands and the Tuomotu archipelago. My time abroad on the high seas further solidified my belief that the ocean is a place that deserves our protection.

After completing my undergraduate studies, I joined the staff at The Dolphin Institute in Maui, Hawaii to conduct photo-identification and behavior research of humpback whales. We also partnered with National Geographic's remote imaging team to deploy Crittercams on humpbacks as a means of obtaining a whale's-eye view of their underwater world. When the humpbacks left Maui to migrate to Alaska, I migrated to Cape Cod, Massachusetts to work with the humpback whale research team at the Provincetown Center for Coastal Studies.

I come to the CMBC most recently from the Catalina Island Marine Institute, where I taught outdoor marine science to school groups who visit from mainland California. From snorkeling to kayaking to hiking, the children receive a powerful hands-on learning experience. I feel lucky being able to share my knowledge and passion of the underwater world with the students. In order for future generations to enjoy the ocean as I do, I hope to become involved in marine protected areas and sustainable fisheries policy.

Heather Belichesky (MAS)

Growing up in southern California, I spent a lot of time at the beaches exploring the sandy environments and unique organisms. From a young age I was interested in marine biology and general conservation. When I decided to attend UC Berkeley for my undergraduate studies I was unsure of which branch of biology or conservation to study.



For three of my years at UC Berkeley I worked in a plant genetics laboratory, although I found this work interesting I knew that I wanted to focus more on conservation. So I participated in the Communicating Ocean Sciences program which taught me how to effectively teach ocean sciences and conservation to elementary school children. After participating in this program I decided to major in environmental science so that I could combine my interests in biology with my interests in conservation. I conducted my senior thesis on the effects of standardized testing on environmental education at the elementary school level in the eastern San Francisco Bay area.

Following my undergraduate studies I wanted to pursue a career in which I could combine my interests in environmentalism and biology. I began working for the US Army Corps of Engineers as a biologist in the Career Intern Training program. Through this program I was able to rotate through the various sections of the agency learning how the agency works and participating in several large-scale wetland restoration, coastal erosion and dredging projects.

While in the Marine Biodiversity and Conservation MAS program I would like to explore better methodologies for utilizing educational and other parameters in wetland restoration and beach

nourishment projects. Having seen many of these projects in construction, I have noticed a need to inform the public about the project purpose and the greater necessity for marine conservation.

Megan Bettilyon (MAS)



Natural science, in its many forms, has fascinated me since childhood. I spent years roaming the deserts and mountains of Utah in pursuit of archaeological, paleontological, and geological wonders. When I moved to California I was thrilled to add oceanography to my list of interests. Although sidetracked to a successful career as a Senior Project Manager for a financial firm in San Francisco, my quest to escape the cubicle, and passion for science, led me to UCSD. I earned my Bachelor's degree in Anthropology, concentration in Archaeology, graduating in 2007. After graduation I spent two excavation seasons working in the country of Jordan, and another season excavating in Cyprus. It was during this time that I became acutely aware of the major interplay between natural and cultural resources, and the need for an interdisciplinary approach to conservation.

Furthermore, my love of teaching, exploring, and diplomacy steered me toward the MAS MBC program; a natural fit for my background and a solid foundation for the work I hope to accomplish.

My goal is to graduate from the Master's program with the knowledge and credibility to create new educational programs that help students explore our world and learn about what conservation really entails. I would like to teach students about the role of biodiversity and cultural management as integral pieces of the ecological puzzle. To this end I hope to establish an educational program wherein motivated students visit, and intensively study in a cross-disciplinary manner, regions threatened by with the loss of cultural and/or natural resources. It is through this effort that I hope to help train new generations of scientists to approach conservation in a multi-faceted light; and so that they may see, first-hand, how it is our responsibility to protect our global natural and cultural heritage.

Dominique Camacho (MAS)

I am a transplanted New Englander. Originally from Connecticut I've been living in Washington State for 9 years. However, you can take the girl out of the east coast, but you can't take the east coast out of the girl. Growing up in Connecticut meant summers on the beach and winters in the mountains. I love the outdoors and enjoy hiking, skiing, and swimming. However, my true love is the ocean. As a child, I explored the beach combing its shores and identifying marine life. As an adult not much has changed. I'm still getting out there scanning horizons and identifying life. I am fascinated by the ocean; its great expanse and the wealth of unknown information it holds. At a young age I knew whatever I did in life would evolve from my attachment to the ocean.



After receiving a dual bachelor's degree from The Evergreen State College, I joined Cascadia Research Collective. It was there that I became involved with the NW Marine Mammal Stranding Network and SPLASH, an international collaborative study of northern hemisphere humpback whales. I have conducted marine mammal surveys throughout the US west coast and Canada, on a variety of platforms including the FLIP. Since 2005 I have performed quarterly surveys with the CalCOFI group, linking marine mammal sightings with acoustic detections. More recently, I've been exploring the various applications of geographic information systems (GIS). In conjunction with the Coeur d'Alene Tribe I have utilized GIS to perform assessments for the EPA and DEQ. In 2008, I co-founded Spatial Ecosystems Inc. an organization applying GIS to environmental assessment and conservation.

I am excited to join the MAS MBC program and establish myself in sunny San Diego. I intend on using the skills and knowledge I gain from the program to help preserve the marine environment. I hope to integrate education outreach into my current endeavors bringing awareness of anthropogenic influences on environmental health and degradation.

Alvaro Casanova (MAS)



My name is Alvaro Palacios Casanova; I am 25 years old, of Mexican decent and I identify as indigenous due to my Mayan heritage. I am from the people of corn, color of the earth. My hometown is Thousand Oaks, California, where I was born and raised. I transferred from Moorpark Community College to the University of California, Berkeley in the fall of 2006. I am a recent graduate from UC Berkeley where I received two Bachelors of Science, in Conservation and Resource Studies and Society and Environment. During my undergraduate studies I traveled to the Society Islands in the South Pacific and Central America, carrying out undergraduate research projects. My future aspirations include working with indigenous coastal communities throughout Latin America doing advocacy work surrounding policy planning and implementation.

Javier Cuetos-bueno (MAS)

As early as I can remember, the ocean has been part of my life, as I grew up in a small fishing village on the Atlantic coast of northern Spain. There I discovered the underwater world well before I even knew how to swim, exploring the tidal pools with some old rubber goggles. After finishing my Health and Environment studies I traveled around the world oceans discovering the great complexity of the oceans and the very different ways that humans interact with these environments, and I became aware of the great need to understand this complexity in order to preserve the oceans integrity for future generations.



For the past five years I lived in Barcelona and worked as an environmental educator while I studied a multidisciplinary bachelor's degree in Environmental Studies at the Universidad Autónoma de Barcelona (UAB) and participated on diverse environmental research and activities. In fall 2008 I came to UCSD-Scripps to complete my undergraduate program with a marine specialization and participate on some of the research carried out at CMBC. Since then I been doing research under Dr. J. Smith's supervision on the effects of ocean acidification on local intertidal calcifying algae and it's ecological consequences.

I will be studying at the MBC, as "la Caixa" fellow, to gain the tools to understand the complexity of the marine ecosystems and the threats they face, and to use use this knowledge to help develop and implement ecology-base restoration and conservation tools, and participate on the basic scientific communication task to involve the local community, government agencies, businesses, and other non-profit organizations on marine conservation.

Alain de Verneil (PhD)

My interest in the sea, along with most marine scientists, began at an early age. The decision to finally pursue marine biology as a full-time career, however, came after a summer during my high school years spent as an employee in the conservation education department as well as a volunteer member at the National Aquarium in Baltimore near where I grew up.



I started my undergraduate work at the University of Miami soon after in marine biology and physics. While in Florida, I had the chance to study abroad at James Cook University in Australia. After diving the Great Barrier Reef, its relative abundance of life stood in stark contrast to my experiences in the Caribbean.

Over the past two years, I've been working with a professor involved with the Earthwatch organization, bringing volunteers to different islands of the Bahamas to learn about coastal ecology, both onshore and offshore. Part of the expedition's specific message incorporates human impacts, in particular development, on such islands. During the past two years I've also witnessed the explosively growing presence of invasive Indo-Pacific lionfish in the region, an unfortunate sign of overall marine degradation.

Having completed my coursework at Miami, I look forward to starting research at Scripps, with the intention to combine my love of the life in the sea with the mathematical equations governing the fluid they live in. I am particularly excited to start off my time here with the CMBC summer course; the curriculum provides a different background and perspective of dealing with the ocean and climate change than a purely scientific one, which all young scientists should be exposed to if science is going to have an efficient positive influence on the globe's health in the coming years.

Niu Du (MAS)

The sun is shining, but the soft breeze drives away the heat. The river, gently flowing, wets my feet.



Occasionally, a school of fish jumps out of the water, and disappears in the spray, quickly, quietly. Twenty years has passed, and all these images are still clear memories; but I can't see these sights in my hometown anymore. Concrete structures cover every trace of wildlife habitat that ever existed. A parking lot is the only playground where kids can enjoy themselves. I went to college far away from home, and there I saw the ocean. It's so wide, boundless, cannot be changed by human beings, I thought. But I was wrong.

At the Ocean University of China, I studied oceanography and learned the inconvenient truth. Having witnessed the microalgae blooming, massive reconstruction of the intertidal zone, and the slaughtering of seals, I began to realize how seriously we are able to disturb this giant aquatic ecosystem. After graduating, I worked at the LiaoNing Ocean and Fisheries Research Institute in DaLian (northeast coastal China), where I continued my study of marine environmental protection and began learning about marine mammals. As I gained experience, I was provided more opportunities to work in the ocean and to participate in various projects. "Chinese Offshore Investigation and Assessment", "The UNDP/GEF Yellow Sea Large Marine Ecosystem Project", "First national survey of pollution source", and many other areal investigations. These experiences increased my curiosity about the mystery in the deep blue, while also deepening my concern about the worsening of the environmental situation. In China, conservation of marine ecosystems is a quite new and unfamiliar subject, and people have not yet obtained the consciousness of saving endangered marine species or protecting their habitats. I believe conservation is important, and I want to better prepare myself for a career in marine conservation.

Ben Fissel (PhD) I am originally from Seattle, Washington and grew up in an area known as Ballard, a fishing port for Seattle. Growing up in the Northwest I developed an affinity for the outdoors. You are very close to nature in the Northwest, with the forests and mountains to the east and ocean to the west. I want to preserve our environment for future generations to enjoy and protect our resources from over exploitation. My respect for nature and commitment to conservation has led me to pursue research in economics that investigates the relationship between people and our use of the world's finite supply of natural resources. I hope that my research will contribute to developing policies that promote the sustainability of natural resources.



I obtained a Bachelor's of Science in economics with a minor in mathematics from the University of Washington in Seattle. I moved to San Diego, California in 2005 to pursue my PhD in economics with a focus in natural resource economics and econometrics. In 2008 I obtained a Masters degree in Mathematics and Statistics from UCSD. The two primary topics in natural resource economics that I research are fisheries and water conservation. The focus of my current work explores how spatial environmental heterogeneity impacts escapement policy, populations and economic variables in fisheries. My future work will continue to explore the dynamic relationship between resources, the environment, and how we as a society can tackle the challenges facing our future.

My background has been primarily in the social sciences and quantitative analysis. I am very excited about the opportunity to interact and learn from other fields at the Summer Interdisciplinary Session at CMBC.

Lauren Frank (PhD)

My curiosity about the ocean began as a kid catching blue crabs on the Chesapeake Bay. Witnessing degradation of the local ecosystem deepened my interests in both oceanography and marine conservation. I pursued marine science in my undergraduate education at the University of Miami. At the Rosenstiel School of Marine and Atmospheric Science I worked on ecotoxicology safety limits for bodies of water and carbonate sedimentology in the Caribbean. A field course in the Galápagos Islands gave me my first taste of a pristine ecosystem, and I have focused my education and research on identifying and protecting other such places. My undergraduate honors thesis used projected sea surface temperatures to identify regions where coral reefs were likely to suffer various degrees of bleaching in the face of climate change. From these predictions, we were able to identify regions where there were potential 'Reefs of Hope' that were likely to survive in the warming ocean and could be used as management priorities. At Scripps I am continuing and refining these ideas by investigating local physical stressors on coral reefs. My goals are to pinpoint key thresholds that can be predicted with oceanographic models and identify reefs likely to survive the changing climate, and to become involved with the implementation of management strategies. The opportunity to be involved in the



interdisciplinary program and summer course is exciting for me, and I am thrilled to have joined CMBC and the Scripps community where I can pursue climate change and marine ecosystem conservation.

Jill Harris (PhD)

I recently completed my Master's degree at the University of Washington, School of Marine Affairs. I studied community management of marine resources, including a year-long study to advise the Olympic Coast National Marine Sanctuary on implementing ecosystem-based management. My thesis, "Social and institutional factors in the development of a network of community-based marine protected areas," took me to Cebu, Philippines, where I examined the feasibility of implementing an MPA network.



a tall ship.

I hold a Bachelor's degree in both Biology and Environmental Studies from Dartmouth College. My undergraduate ecology research included coral reef studies at the Discovery Bay Marine Lab in Jamaica and spatial aquatic ecology at the Savannah River Ecology Laboratory in Georgia, as part of the NSF Research Experience for Undergraduates program. My first experience with interdisciplinary ocean studies was as a student in the Williams College - Mystic Seaport Maritime Studies program which includes classes in oceanography, history, policy, and literature in addition to field research and an offshore sail on

Teaching has been an integral part of my academic and professional career. At UW, I taught several graduate and undergraduate classes, including Interdisciplinary Foundations of Environmental Studies, Aquatic Animal Physiology and Reproduction, and Research Proposal Writing. Prior to graduate school, I spent several years on the 100-mile long and 2-mile wide island of Eleuthera, Bahamas, where I taught marine science and math to American and Bahamian high school students at The Island School. As a researcher at the Cape Eleuthera Institute, I also developed a research study on the ecological and social aspects of a proposed marine protected area.

My research focuses on the ecology and human use of tropical marine systems, particularly small-scale coral reef fisheries and marine protected areas. I work to understand the many dimensions of complex human-ecological systems, taking into account both the natural and social sciences. I also strive to improve public scientific literacy through communication and education. Originally from northern California, I grew up in the Washington, D.C. area and like to describe myself as "a big fan of the ocean."

Matthew (Matt) Huelsenbeck (MAS)

The first striped bass I ever caught died on a beach in Cape May, New Jersey from being gut hooked. It was shorter than the legal limit. My ten-year-old brain was frenetic and I was certain I was going to do hard time. That night my father explained the fundamentals of fishing regulations to me, and it

marked the beginning of my interest in fisheries management. Later in life, I would continue to discover complexities and challenges involved with regulating fisheries.



policy.

Most of my experience with marine life was at the Jersey shore, but I grew up in Pittsburgh, PA with an affinity for outdoor adventure, travel and wildlife. My interests led me into an Environmental Studies major in the School of Interdisciplinary Studies at Miami University. As a member of the School of Interdisciplinary Studies, I was part of a diverse group of students who designed their own fields of concentration by selecting courses from several academic departments. My chosen course work provided me with a broad comprehension of natural sciences and public

Completing a requirement for graduating from the program I proposed and then conducted a year-long senior research project which synthesized disciplines I had studied. My project explored the multifaceted topics involved with commercial ocean iron fertilization as a potential mechanism for mitigating climate change. My research integrated scientific, policy, and market-based elements, including interviews with the top executives attempting to develop the industry.

During my undergraduate years, I also had the opportunity to study abroad at the University of Auckland, New Zealand. When I wasn't gallivanting around in the picturesque countryside and coasts, I took a selection of courses granting me a worldly outlook on environmental topics and governance. It was a marine science course during this study abroad which intensified my interest in marine biodiversity. During the course, I conducted field studies on the effects of whelk aggregations on cockle populations in the Whangarei Harbour Marine Reserve and learned about New Zealand's strictly regulated fisheries and world-class marine protected areas.

Outside of the classroom, most of my recent work experience has been involved in grassroots politics. In the combination of two previous jobs, as a fundraiser for environmental nonprofit groups and as a field organizer for a congressional campaign, I canvassed several thousand individuals. On the doorsteps of strangers, I engaged in exclusive conversations about life experiences, views on environmental issues, and on an array of political topics. Recently, I also worked as a research assistant for an energy efficiency company in Ithaca, NY called Performance Systems Development (PSD). In this position, I promoted an energy efficiency curriculum to community colleges and diagnostic software to weatherization agencies.

I chose the Center for Marine Biodiversity and Conservation because I appreciate its emphasis on an interdisciplinary approach to environmental problem solving. Contextualizing complex environmental issues such as fisheries from the viewpoint of multiple stakeholders requires an interdisciplinary scientific understanding of the natural systems being afflicted as well as the economics of resource consumption and the application of both to sound public policy.

During my graduate studies, I want to investigate the implications of escalating global changes on the adaptation of national and international fisheries management. My goal is to translate the skills I gain during this program into a passionate career dedicated to sustainable use of the ocean's resources. For these reasons, I am eager to continue my research and advanced education at the Center for Marine Biodiversity and Conservation.



Amanda Keledjian (MAS)

The ocean has inspired my curiosity ever since I played in the waves and collected seashells as a child growing up at the beaches in southern California. It seemed only natural that my love of marine life would develop into an academic pursuit throughout my schooling. In a semester away from Grinnell College, where I earned bachelor's degrees in biology and anthropology, I studied environmental science at the Marine Biological Laboratory in Woods Hole, MA. While there, I was fascinated by the landscape of Cape Cod and completed an independent project examining the effects of eutrophication on estuarine brittle star communities. Before graduating, I traveled to Costa Rica through the Organization of Tropical Studies to gain hands-on experience in tropical ecology. In these areas of

undeniable beauty, I was struck by the many discrepancies between local and government attitudes toward resource management.

Most recently, I have volunteered as a marine educator teaching children about pollution and sea creatures with the Roundhouse Marine Studies Lab and Aquarium in Manhattan Beach, CA. I have also developed a passion for marine mammals working as an animal husbandry intern at the Long Beach Aquarium of the Pacific and at the Marine Mammal Care Center at Fort MacArthur in San Pedro, CA.

My academic interests span many things ranging from tide pool ecology, marine mammal reproductive strategies, and public perception of conservation policies. My myriad career goals include helping communities develop practical use of sustainable resources. Ultimately, I will forever be learning from and advocating for the ocean and its many inhabitants. In the near future, I want to work abroad and hope to learn marine mammal photo identification techniques and participate in a sea turtle conservation project.

My general interests include hiking, photography, scuba diving, traveling, and being with animals. I am very excited to be a part of this M.A.S. program to meet other like-minded students of nature and to discover new things about myself that will propel me into a future surrounded by the ocean.

Matt Leslie (PhD)



My first introduction to the ocean was at the age of eight, via a glossy coffee table book by Jacques Cousteau. The more I read, the more intrigued I became with the mysteries of ocean life. Despite the long-term relationship between man and the sea, we'd failed to learn much about it. My curiosity boiled into desire. I left small town Oklahoma at the age of nineteen to travel to the other side of the planet to participate in my first marine research project. I worked with the Australian parks service on a long-term study to estimate population size of humpback whales. I returned to Oklahoma State University to pursue a degree in Zoology. Here I experienced the use of the powerful tool of genetics. I knew I didn't want to be a 'lab rat', but I was amazed at the answers genetics provided organismal and population biologists. As I graduated from OSU (a fourth generation OSU grad I might add) I was awarded an NSF Research Experience for Undergraduates internship at the American Museum of Natural History in New York City; the project was studying population connectivity in Southern Hemisphere humpback whales. Shortly thereafter I was hired by the Wildlife Conservation Society to study a broad array of conservation issues. As part of this position I performed field research in Madagascar for three years and present results of our whale research to the scientific committee of the International Whaling Commission. For the last three years, I have managed the AMNH's new Sackler Institute for Comparative Genomics, an exciting and dynamic group of researchers pushing the envelope of non-model genomics research. Last year I was awarded an NSF Graduate Research Fellowship. I am delighted to begin graduate school at SIO with the CMBC summer program, as I will be teaching and learning from others who share my passion for research and conservation.

Julianna Mullen (MAS)

I grew up north of Boston, Massachusetts in a small fishing town. My mom kept me out of trouble in the summers by teaching me how to sail, and being on the water seems to have stuck with me. I learned to scuba dive when I was 12 on the Great Barrier Reef and once I stopped being terrified of seaweed, I loved it and kept going until I earned a professional certification.



In high school, I did a summer program with SEA Education Association working on the Catalina Island lab researching kelp growth and spending a couple weeks sailing between LA and San Francisco on the *Robert C. Seamans*, a 134' brigantine tall ship. I minored in biology at Wellesley College and pursued more focused marine studies outside of school, including a semester abroad with the School for Field Studies tracking fish spawning and migration and another stint on the *RCS* with SEA studying heterotrophic bacteria in river plumes. Somewhere in there I traveled to Africa to work with cheetahs and got an English degree as well.

I graduated a semester early to travel to the Philippines for half a year and work for a British charity doing coastal reef assessments and community education on the island of Leyte. When I returned, I tried being an editorial intern at National Geographic Adventure magazine in New York City but decided pretty quickly that I didn't want a desk job. I moved on to New Orleans, where I worked at the Audubon Aquarium of the Americas as their dive officer and curator of the changing exhibits gallery.

I would like to take what I learn at the MBC and bring multi-tiered conservation approaches to disadvantaged coastal regions who otherwise would not have a chance to both use and preserve their natural resources.

Stephanie Nehasil (MAS)



I grew up in the San Francisco Bay Area where I was able to spend much of my time outdoors exploring the hills and wildlife behind my house. Frequent day trips with my family to the coast, studying marine biology in elementary school, and a special fieldtrip to The Marine Mammal Center (TMMC) eventually influenced my passion for the marine environment.

As an undergraduate at UC Davis I juggled a schedule of work, school, and sports. While science has always been my career choice, I have also felt that cultural studies is equally important, so I decided to double major in Evolution and Ecology as well as French. When I wasn't studying, I was playing soccer for the UC Davis Women's Soccer club. During my last few years of college, I worked between classes for research labs on campus. At UC Davis Foundation Plant Services I studied the presence and effect of grapevine viruses on a number of wine grape varieties. At the same time, I worked in the UC Davis Animal Science Department focusing on research of livestock waste management.

After graduating from college, I pursued my passion for marine mammals and interned in the Stranding Department at TMMC. I had the unique experience of rescuing animals ranging from elephant seal pups to 150 pound California sea lions. The most rewarding aspect of this internship was caring for animals I had rescued and then partaking in their release back into the wild. I have since been working in the Education Department at the San Francisco Zoo, where I have been actively involved in conservation by educating students, volunteers, and Zoo visitors about wildlife and conservation issues.

My interest in the marine science field lies between research and policy. Ultimately, I would like to use research findings of human-related and natural factors affecting marine mammals as a basis for marine mammal conservation and management.

Amanda Netburn (MAS)



I have had a longstanding interest in conserving and enjoying the oceans' resources. I first learned to SCUBA dive and conduct research in the marine environment during a semester with the Institute for Cultural Ecology. I completed an internship program that involved coral reef surveys, dolphin behavior studies and sea turtle health assessments throughout the main Hawaiian Islands.

The following summer, I worked for the Oregon Museum of Science and Industry's Salmon Camp program. There, I supervised Native American adolescents and, alongside the students, worked with resource managers and biologists throughout the northwest who were working on the complex issues involved with managing salmon in the region.

During my last year at Stanford University, where I majored in Biological Sciences, I participated in Stanford@SEA, a collaborative course with Woods Hole Oceanographic Institute. Following coursework at Hopkins Marine Station, I spent five weeks aboard a research sailing vessel on a cruise track from

Honolulu, Hawaii to Palmyra Atoll and Kingman Reef. I completed a project on myctophid feeding behavior, and assisted in a variety of projects at Palmyra Atoll.

After graduating, I worked for sixteen months as a Research Assistant at The Blue Ocean Institute in New York, primarily doing research on seafood products for their From Sea to Table program.

Returning to Hawaii, I got to play in the Pacific for several years as a SCUBA Instructor. I am also a licensed boat captain.

Most recently, I worked at Kona Blue Water Farms, an aquaculture facility that raises Almaco Jack (*Seriola rivoliana*) and markets it as Kona Kampachi®. I have worked in production, as a Larval Rearing Technician, and later transferred into their research division.

I am seeking this degree because I want not only to contribute to science that leads to a better understanding of the oceans, but also to become a leader in applying this knowledge to implement true sustainability of the resources therein. Specifically, I want to work on halting the overfishing of our oceans and determining how best to rebuild and protect fish stocks on local through global scales. After graduating, this will most likely be accomplished by working for a government agency such as NOAA or returning to non-profit work.

R.J. Rezek (MAS)



I've been interested in Marine life since I was old enough to assist my parents with the upkeep of our saltwater aquarium. Growing up, I found myself increasingly drawn to marine life and the ocean. Scuba Diving has been a passion of mine since I got my certification at fourteen. I spent much of my time off from school on diving trips and obtained my dive master certification at eighteen.

After high school I attended UC Santa Cruz where I received a BS in Ecology and Evolutionary Biology. While at university I conducted a research project on invasive kelp known as *Undaria pinnatifida* (Wakame) that has invaded the Monterey Harbor. In order to conduct the necessary research for my project, which required many hours underwater, I was certified as an AAUS Scientific diver.

After graduating from university I got a job working as a fisheries technician for the Pacific States Marine Fisheries Commission. I collected data that is used by the California Department of Fish and

Game in Stock assessments. This experience has furthered my interest in coastal fisheries management from both a biological and political perspective. During my time in San Diego I hope to expand upon my combined knowledge of phycology and coastal management and gain a further and deeper understanding of issues facing marine conservation.

Megan Roberson (MAS)



I have had a love for the ocean and its inhabitants ever since I can remember. Spending eleven years in central North Carolina kept my visits to the coast at a minimum. When the time for college came around, I was anxious to get close to the water and begin pursuing my true passion.

While I was working on my B.A. in Environmental Studies at the University of San Diego, I had the opportunity to obtain my SCUBA Certification and enjoyed diving and snorkeling as much as possible. I was also fortunate enough to work at the City of San Diego's Environmental Services Department. Here I gained valuable experience working with local government and understanding the importance of solid waste management.

After graduation I was hired as a Geographic Information Systems Analyst by San Diego Data Processing Corporation to fill a contract position with the Environmental Services Department's Collection Division. Although I was fortunate to find such a good job so quickly, I knew that my love

for the ocean would be enough to pull me in a new direction. Acceptance into the MAS MBC program was just what I was waiting for and I am anxious to use my GIS experience in a new field of study.

Abbie Sloan (MAS)



Growing up in Salt Lake City, Utah, the ocean was such an intriguing place to me. I remember taking beach vacations with my family and never wanting to leave. I'd sit on the water's edge all day, transfixed with the ebb and flow, until my body was numb with cold, and my mother would have to drag me away. This fascination grew stronger with age, but the realization of wanting to study marine science came while sitting in a dentist's waiting room. I started reading a *National Geographic* article about the decline of sharks. The story was difficult for me to comprehend because it talked about people hunting sharks just for the "kill" or discarding the whole animal after only taking the fins. How could people be so cruel? It was at that moment I knew I wanted to make a difference in trying to protect our oceans' diversity.

I obtained a bachelor's degree from The Evergreen State College in Olympia, Washington. After graduating from Evergreen I got a job working with the Washington Department of Fish and Wildlife as a Scientific Technician out at Westport, Washington. As a Scientific Technician my job responsibilities involved taking biological samples from the salmon being caught each day, reporting all catch and by catch, counting effort by sport and commercial fishing, observing on charter vessels, and checking to see if fishermen caught their limit of fish. I worked at Westport for a total of 12 months until I found my more recent job as a lead Marine Mammal Observer (MMO) on seismic surveying vessels in the Gulf of Mexico. I worked on the vessels conducting visual surveys and making sure no protected species were within 500 meters of the air guns. When a specific animal enters the "exclusion zone" I had to tell the vessel to shut down all production.

My five weeks on – five weeks off work schedule allowed me to live basically anywhere, so I ended up moving to San Diego because of the location to the school I want to attend. As soon as I moved to San Diego I began volunteering at the Birch Aquarium as a Tide Pool Interpreter and volunteering with San Diego's Harbor Excursions during the Grey Whale migration season. I have also done work assisting Dr. Kalmijn with the upkeep of his sharks.

In all my jobs I have worked with or around natural resources and I have learned a tremendous amount about marine life and marine conservation. The experiences have taught me the importance of maintaining good stewardship and I understand the need to implement measures in order to keep our resources and biodiversity afloat. I love marine life. I used to believe that all I wanted to do was research and work with the animals. I've realized, however, that working in the policy side of things will have more of an impact on the animal's survival, and even though I may not be working in the field as much as I had once hoped, I will be making a positive impact for the marine environment. Politics and policy run and influence many environmental initiatives. Understanding the interplay between policies, preservation, and conservation would be helpful in advocating for the causes and hopefully making a difference.

I eventually would like to work for NOAA or another government agency, and I believe that going back to school and obtaining a Master's degree is the next step toward this goal. I'd like to study the effects of noise pollution in the marine environment. I would also like to know what causes so many mass strandings of marine mammals. My goal is to preserve our oceans diversity while stopping harmful human impact in the marine environment. I have such a strong desire to go into policy and conservation. I would like to see our oceans to flourish; I want marine biodiversity to grow rather than perish; and I plan to be involved in the process in which these things can happen.

Elizabeth Terk (MAS)

Growing up in New York City, I took every opportunity I could to go to the ocean. Summers spent of the coast of Long Island and family trips fueled my interest in marine biology. As soon as I was old enough I learned to SCUBA dive. Summers spent in high school traveling, SCUBA diving, and studying marine biology further fueled my passion for the ocean.

I received my degree in Biology from Occidental College. During college I studied abroad in Zanzibar, Tanzania and did an independent study on the ecology of salt water ponds for a possible ecotourism project involving turtles. My summers during college were spent leading educational adventure trips. I taught Scuba diving and lead trips through out the Caribbean and Egypt and had the opportunity to share my love of the ocean with others.

After college I volunteered as a High School teacher in Pohnpei, Federated States of Micronesia. I taught Biology, English, and Math. After volunteering I accepted a job as a full time teacher through the Pohnpei State Department of Education.



My interests in marine biology and conservation drove me to apply for a position at the Conservation Society of Pohnpei (CSP). As Deputy Director of CSP I have had the opportunity to work in both terrestrial and marine community based conservation. I have helped manage Marine Protected Areas, worked with community members, government officials and traditional leaders to demarcate a portion of the Pohnpei State Watershed Reserve, established community based Mangrove Reserves, and helped introduce an Environmental Resource and Activity Book into Pohnpei's elementary schools.

I hope to use the multi-disciplinary aspect of the MAS MBC program as a way to become a better interpreter between community members, scientists, politicians, and resource managers.

Lauren Washington (MAS)



I was born in Torrance, California, but moved away in Elementary School to Phoenix, Arizona. Being several hours away from the ocean only strengthen my curiosity for the sea.

I received my B.S. in Conservation Biology from Arizona State University in December 2006. It was in college that my interest in marine animals made a scientific turn and where I was first introduced to the practice of marine conservation. During college, I studied the seasonal relationships between antioxidants, health and coloration in the Arizona State University campus House Finch population. I was also involved in other projects during the summers I attended college. In the summer of 2005, I traveled to Mexico where I studied the behavior of the declining population of California Sea Lions. During the summer of 2006, I interned at the Alaska SeaLife Center working with Steller Sea Lions. My internship consisted of monitoring a Steller Sea Lion rookery throughout the breeding season.

After graduation, I moved to Hawaii to work in NOAA's Protected Species Division. I spent four months studying the behavior of the endangered Hawaiian Monk Seal in the Northwestern Hawaiian Islands. Most recently, I worked in Hawaii monitoring the total allowable catch of the Bottomfish fishery in the Main Hawaiian Islands. Hawaii was also the perfect place for me to obtain my SCUBA certification. Over the past year, I have been an avid diver around the island of Oahu.

I plan on using the knowledge I acquire in the MAS MAC program to further a career in marine conservation and research.

Jessica Wiseman (MAS)



I moved a lot as a child and spent my childhood in California, North Carolina, Australia, Wisconsin, and New Jersey; in that order. Although I grew up in a diverse group of locations, I always felt a natural draw towards the ocean and the creatures that inhabit it. I learned how to snorkel on the Great Barrier Reef and have visited and snorkeled at some of the best destinations for pristine reefs, or at least as pristine as they can be these days. This intense connection I have always felt toward the ocean and its inhabitants has driven me to want to protect it. I attended Wake Forest University where I majored in Communication and minored in Biology. Since graduating, I have held jobs at a PR firm and done marketing/promotions for two major magazines in New York City. While I've

enjoyed my career and have learned a lot, I have never quite felt fulfilled. With time, I've realized that it is hard for me to truly care about the work that I did on a daily basis and came to the conclusion that in order to be truly fulfilled in my career, I needed to focus all my energy into a job in which I sincerely care about the outcome. This realization brought me back to my first love, the ocean. I plan to use MAS MBC degree to redirect the course of my career, and utilize my background in communications and marketing to promote the protection of our oceans and the diversity of life they support.

Shannon Yee (MAS)

I was born in Los Angeles and moved to Atlanta when I was five, but those years in California inspired my love for marine and coastal environments. Some of my fondest memories were from the weekends my family spent in Santa Monica Bay and Long Beach. My first time scuba diving was life changing—that first breath underwater was a mixture of the exhilaration and fright of being immersed in the unfamiliar, disorienting, yet wonderful world. I am still in awe of that moment. The ocean has a way of making us realize how large and small our world is and, while we may never know everything



it holds, we still affect it for better or for worse. I received my Bachelors degree at the University of Georgia in Environmental Economics and Management. Environmental economics aims at balancing development and growth with conservation and protection by encouraging people to fully understand and weigh the benefits and costs of a decision. While at UGA, I have studied abroad in New Zealand, volunteered at the Port St. Joe Buffer Preserve Area in Florida, worked with Georgia Representative Jim Marshall in Washington D.C., and researched with Georgia's Sea Grant Program. My time in Washington D.C. began my interest in public policy by seeing its influence on marine and environmental affairs. I worked with Georgia Sea Grant studying the economic and social incentives for developers and homebuyers to utilize low impact coastal development in the

highly productive Georgia marshland. I plan on continuing to focus on coastal development and marine policy. I hope to work in a private or public sector position helping companies who wish to develop along the coast do so in a more sustainable manner and conducting research to be used to raise public awareness of marine and coastal issues.