The Romberg Tiburon Center
for Environmental Studies

World-class science with a focus on San Francisco Bay

Annual Report 2004
An optical plankton counter recording the abundance of microscopic animals, light, temperature and salinity as it is towed through the Bay
The Romberg Tiburon Center for Environmental Studies is the marine research field station of San Francisco State University and is located approximately 20 miles north of the main campus on the Tiburon Peninsula.

The Romberg Tiburon Center strives to be recognized as the leading estuarine and coastal academic institution on the West Coast of the United States.

As the only marine science teaching and research facility located on San Francisco Bay, the 2nd largest estuary in the United States, our laboratory stretches from our doorstep to coastal environments all around the world.

Our goal is to provide modern innovative facilities and to secure the resources to facilitate the scientific research necessary to comprehend and elucidate the complex processes of estuarine and coastal marine environments. We endeavor to prepare the next generation of scientists to carry on this critical work around the world through hands-on research under the direct mentorship of renowned university faculty. We are committed to serving the urban population by imparting a means for the comprehensive knowledge of environmental issues, sustainability and stewardship.

The Romberg Center boasts a rich history. Uses of the site have varied from a Codfish Cannery, to a Coaling Station for ocean going vessels, to a staging area for the Roebling Company during the construction of the Golden Gate Bridge. During WWII, the property was host to the Navy Net Depot, where the antisubmarine nets for San Francisco Bay were built and repaired.

The Center is situated on a 34-acre waterfront parcel. The physical facilities are comprised of the original six buildings and include: the main research laboratory and teaching facility; the administrative and teaching facility; the Bay Conference Center; the Marine Technical Operations and Shop facility; the Ohrenschall Guest Center, a storage facility and Anthropology archives; and other ancillary facilities. RTC also owns several boats used for research including a 38' aluminum hulled vessel, the R/V Questuary and a new Twin V outboard.
The mission of the Romberg Tiburon Center for Environmental Studies is to provide an interdisciplinary understanding of complex marine and estuarine environments.

Romberg Tiburon Center scientists pursue research focused on questions regarding fundamental marine issues, train the next generation of scientists, and provide knowledge that allows informed environmental decision-making and stewardship.
The Romberg Tiburon Center for Environmental Studies

The Organization and Structure

The Romberg Tiburon Center is administered by a Director, Dr. Alissa J. Arp, who reports directly to the Dean of the College of Science and Engineering, Dr. Sheldon Axler, the Provost, Dr. John Gemello, and the President of the University, Dr. Robert Corrigan. The Romberg Center's scientific staff consists of the Director, nine other tenured or tenure-track faculty with appointments in home departments at SFSU, eight research scientists, one professor emeritus, six postdoctoral associates, two visiting scientists, twenty-seven research technicians, and an on-site staff of fourteen persons. In academic year 2003-2004 there were eight undergraduate students, and twenty-nine graduate students, three high school students, seven interns, six student assistants, and five volunteers involved in laboratory research. The Center also has twenty-two scientists and support personnel on site who lease space from the Center.

Research Activities

Researchers, faculty and students study biodiversity, community ecology, ecological physiology, evolutionary biology, microbiology, molecular biology, oceanography and wetland ecology and restoration. RTC scientists are the recipients of numerous awards that support this type of research, the findings of which are published in prestigious scientific journals. RTC has emerged as a major player in establishing California cooperative science programs this year including -- CI-CORE, the Center for Integrative Coastal Observation, Research and Education; CenCOOS, Central California Ocean Observing Systems; and the proposition 40 initiative to support the monitoring of coastal circulation off northern California. Additionally this year, we celebrated the designation of the San Francisco Bay National Estuarine Research Reserve (SF Bay NERR), launching an important, nationally funded program headquartered at RTC and administered by SFSU.

RTC faculty and lecturers successfully accomplish their teaching mission both in their laboratories and in the classroom. During AY 03-04, seven classes were conducted on site. RTC faculty also taught thirteen courses on the main campus during this period.

In the research laboratories, undergraduate students and graduate students worked on their research projects under the direction of Center scientists, with seven completing their theses this year. Students regularly publish the results of their research and attend scientific meetings where they make oral and poster research presentations.
Outreach Activities

The Romberg Tiburon Center is committed to educating the public about the importance of marine environments by sharing our scientific expertise through education and outreach activities. We reach a local audience from children to adults, students to teachers, in both formal and informal settings.

Outreach activities include our annual open house, **Discovery Day**, teacher training work-hops for middle and high school teachers, and summer session classes offered through extended education. Faculty members speak at local venues such as the Belvedere Tiburon Library and community Rotary clubs, and participate in high school career fairs. Annually our scientists volunteer their time as judges at the middle school and high school Marin County Science Fairs.

Additionally, all members of the RTC community participate in local events such as beach clean-ups, Earth Day and many other local and national environmental events. We have recently partnered with two local organizations who share our mission, The Bay Area Discovery Museum and The Bay Model Association. These partnerships have expanded our impact on the local community and have continued to evolve and create additional ties and partnerships for RTC locally.

We have a full time Outreach Coordinator, Adria Lassiter on staff. Adria received her MA in marine biology from RTC/SFSU in 2003, and knows the Center and San Francisco Bay well. Under her leadership, we will continue to expand and develop our outreach program, and to develop working relationships with other Bay Area organizations with ocean science literacy as their goal.
The Romberg Tiburon Center for Environmental Studies

Total Revenues 1997-2004

The Romberg Tiburon Center receives funding from several sources. SFSU provides salary support through the College of Science and Engineering (COSE) budget for faculty, lecturers and administrative staff; the Bay Conference Center account pays staff salaries and supplies and expenses; and a RTC operating budget based upon activities that brought in indirect cost return (ICR) revenues to SFSU. Private donations received are used to support student scholarships, educational outreach programs, and facilities and renovations. Funding amounts including total grants received by the Romberg Tiburon Center are shown below for fiscal years 1997 - 2004.

<table>
<thead>
<tr>
<th>Category</th>
<th>FY 97-98</th>
<th>FY 98-99</th>
<th>FY 99-00</th>
<th>FY 00-01</th>
<th>FY 01-02</th>
<th>FY 02-03</th>
<th>FY 03-04</th>
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<tr>
<td>SFSU allocation</td>
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<td>$209,858</td>
<td>$282,079</td>
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<td>COSE Salary Support</td>
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<td>COSE Supplies &amp; Expense</td>
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<td>SFSU Facilities Support</td>
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<td>$156,792</td>
<td>$184,566</td>
<td>$191,363</td>
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<td>Questuay Revenue</td>
<td>$34,344</td>
<td>$53,698</td>
<td>$45,831</td>
<td>$27,915</td>
<td>$27,453</td>
<td>$28,950</td>
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<td>Subtotal</td>
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<td>Private Foundation Awards</td>
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<td>Subtotal w/ donations &amp; awards</td>
<td>$1,116,411</td>
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<td>$1,475,695</td>
<td>$2,102,444</td>
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<td>Grant Awards to RTC PI's</td>
<td>$1,156,746</td>
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<td>$4,552,720</td>
<td>$4,355,000</td>
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<td>TOTAL REVENUE</td>
<td>$2,273,157</td>
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The Romberg Tiburon Center for Environmental Studies

RTC Total Grant Activity by Fiscal Year

SUMMARY OF ANNUAL ACTIVITY

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<td>RTC enrollments</td>
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<td>Campus enrollments</td>
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<td>Research funds awarded</td>
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<td>Research funds pending</td>
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<td>Resident PhD level scientists</td>
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<td>Visiting Scientists</td>
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<td>Research Technicians</td>
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<td>Graduate Students</td>
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<td>Undergraduate Students</td>
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<td>High School Students</td>
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<td>Interns</td>
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<td>Staff</td>
<td>15</td>
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<tr>
<td>RTC Student Theses (total)</td>
<td>38</td>
<td>44</td>
<td>47</td>
<td>54</td>
<td>61</td>
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</table>

*includes subcontracts to other institutions
The Romberg Tiburon Center for Environmental Studies

The Faculty

Alissa J. Arp  Marine ecological physiologist; investigates how organisms cope with hypoxia and toxic conditions in estuaries and on the ocean floor.

Roger Bland  Physicist; studies underwater acoustical monitoring using sonar signals to measure water temperature and current speed circulation patterns in SF Bay.

Stephen M. Bollens  Biological oceanographer; studies behavioral ecology, population biology, and community ecology of zooplankton and larval fishes.

Katharyn E. Boyer  Wetland and coastal community ecologist; studies the role of species interactions in ecosystem functioning, particularly in restoration settings, and the effects of nutrients and other perturbations on wetland communities.

Edward J. Carpenter  Biological oceanographer; studies the ecology of marine phytoplankton, particularly cyanobacteria, and the factors affecting the significance of nitrogen fixation in the sea.

William P. Cochlan  Marine microbial ecologist/biological oceanographer; studies the physiology and ecology of phytoplankton and bacteria, including Harmful Algal Blooms.

C. Sarah Cohen  Ecological, evolutionary biologist and population geneticist; studies connectivity of marine populations, human impacts on aquatic systems, immunogenetics and recognition systems.
Carlos E. Crocker  Comparative physiologist; studies ecophysiology of hypoxia-tolerant ectothermic vertebrates (fish and turtles in particular). Research projects involve cardio-respiratory, acid-base, and stress responses to hypoxia, hypercapnia, and anoxia.

Richard C. Dugdale  Biological oceanographer; studies distributions and effects of nutrients on oceanic productivity in coastal and equatorial upwelling areas using isotopes and remote sensing.

Patricia G. Foschi  Remote sensing specialist and physical geographer; integrates remote sensing, GIS and artificial intelligence for environmental applications. Currently developing automated systems for detecting invasive vegetation in wetlands.

Newell Garfield, Physical oceanographer; studies oceanic circulation in coastal regions and over continental margins using remote sensing and free-drifting buoy technologies.

Michael N. Josselyn, Wetlands ecologist; conducts wetland restoration and enhancement projects in coastal wetland ecosystems.

Wim Kimmerer, Biological oceanographer; studies growth and predation processes in zooplankton, computer modeling of ecological systems, and analysis of human impacts on estuarine and marine ecosystems.

Tomoko Komada, Biogeochemist; studies the dynamics of non-living organic matter in freshwater and marine systems, with focus on the factors affecting the long-term organic carbon cycle.


**Jaime C. Kooser,** Resource geographer; manages the SF Bay National Estuarine Research Reserve with a focus on tidal marsh restoration, using science to inform coastal resource management decisions, and studying the relationship between land use and water quality.

**Gretchen LeBuhn**  Evolutionary ecologist; studies the ecology, evolution, and conservation of plants and insects with a focus on solitary bees.

**Steven Obrebski**  Marine ecologist; studies benthic ecology, population biology, and effects of pollution on marine populations.

**Dale Robinson**  Phytoplankton ecologist and physiologist; examines changes in ocean productivity and photosynthesis that result from variations in the physical environment.

**Drew Talley**  Biological oceanographer; Research Coordinator of the San Francisco Bay NERR, studies the influence of habitat connectivity on wetland and coastal community structure and function, focusing on conservation and restoration importance.

**Frances P. Wilkerson**  Marine biologist; investigates nutrient flux in symbiotic associations between invertebrates and algae, and the response of phytoplankton to upwelled nutrients and eutrophication.

**Gregory Ruiz, Visiting Scientist**  Invasive Species Studies: Senior Scientist at the Smithsonian Environmental Research Center, heading the Marine Invasion Research Laboratory – the largest research program in the U.S. to focus on the invasion of coastal ecosystems by non-native species.


MASTER THESIS BY RTC GRADUATE STUDENTS 2004

Bills, Jena - 2004 - Is Mid-Ocean Exchange Effective in Preventing the Invasion of Estuaries by Zooplankton from Ships’ Ballast Tanks? Wim Kimmerer, Advisor

Federline Dean, Amy - 2004 - Marshes as a Source or Sink of an Estuarine Mysid: Demographic Patterns and Tidal Flux of Neomysis kadiakensis at China Camp Marsh, San Francisco Estuary. Stephen Bollens, Advisor


Johnson, Amber -- 2004 --The effect of Temperature on Silicification in Diatoms. Frances Wilkerson, Advisor


Matsumoto, Yukari - 2004 - The Spatial Patterns and Growth Rates of an Invasive Cordgrass (Spartina alterniflora) and the Influences on Sedimentation in Alameda Marsh. Trish Foschi, Advisor.

### SELECTED CURRENT AWARDS

<table>
<thead>
<tr>
<th>Scientist, Funding Agency</th>
<th>Proposal Title</th>
<th>Amount</th>
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<tr>
<td>Arp, NOAA</td>
<td>Establishment of a Prototype Monitoring Station at RTC</td>
<td>$285,650</td>
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<tr>
<td>Arp, NSF</td>
<td>My Place by the Bay subcontract with the Bay Area Discovery Museum</td>
<td>$108,580</td>
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<td>Bollens, CALFED</td>
<td>Understanding Tidal Marsh Processes and Patterns: Fishes and Invertebrates</td>
<td>$256,744</td>
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<tr>
<td>Carpenter, CALFED</td>
<td>Integrated Regional Wetlands Monitoring Research</td>
<td>$205,458</td>
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<tr>
<td>Cohen, EPA STAR</td>
<td>Population Signatures of Immunogenetic Adaptation to Environmental Stress</td>
<td>$220,575</td>
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<td>Cochlan, NSF</td>
<td>Nitrogen Utilization in the Southern Ocean Mesoscale Iron Enrichment Experiment</td>
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<td>Cochlan, NSF</td>
<td>The Ecology and Oceanography of Toxic algae in the Northeast Pacific Ocean</td>
<td>$928,781</td>
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<tr>
<td>Crocker, NIH</td>
<td>Assessment of regional blood flow distribution in turtles</td>
<td>$104,000</td>
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<tr>
<td>Dugdale, USC SeaGrant</td>
<td>Impact Of Anthropogenic Ammonium on Primary Production in Estuarine and Coastal Ecosystems</td>
<td>$104,182</td>
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<tr>
<td>Foschi, CALFED and others</td>
<td>Effects of climate on the vegetation and hydrology of the Bay-Delta watershed</td>
<td>$365,282</td>
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<tr>
<td>Garfield, Arp and Paduan, COCMP</td>
<td>Coastal Ocean Circulation Monitoring Program for Central and Northern California</td>
<td>$9,699,871</td>
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<tr>
<td>Kimmerer, NSF</td>
<td>Does Mating Success Determine Population Growth Rate at Low Abundance in Marine Copepods?</td>
<td>$568,921</td>
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<td>Kooser, NOAA</td>
<td>SF Bay NERR: Operations, Education and Monitoring</td>
<td>$465,000</td>
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<tr>
<td>Robinson, Department of Energy</td>
<td>Photosynthetic characteristics, metabolism, nutrient requirements of diatom species from Antarctica.</td>
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<td>Wilkerson, Department of Energy</td>
<td>The coupling between carbon &amp; nitrogen cycles in coastal upwelling ecosystems</td>
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### RTC COURSES 2004

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<td>Carpenter</td>
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<tr>
<td>Marine Symbioses</td>
<td>Wilkerson</td>
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<tr>
<td>Molecular Approaches</td>
<td>Cohen</td>
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<tr>
<td>Physical Oceanography</td>
<td>Garfield</td>
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<tr>
<td>Wetland Ecology</td>
<td>Boyer</td>
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### COURSES TAUGHT BY RTC FACULTY ON CAMPUS 2004

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<td>Advanced Topics in Physiology</td>
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<td>Animal Physiology</td>
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<td>Aquatic Communities</td>
<td>Boyer</td>
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<td>Environmental Pollution</td>
<td>Komada</td>
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<td>Marine Biology</td>
<td>Rollwagon Bollens</td>
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<td>Extreme Biology</td>
<td>Crocker</td>
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<td>Human Physiology</td>
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<td>Introduction to Oceanography</td>
<td>Carpenter</td>
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<td>Introductory Biology</td>
<td>Crocker</td>
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<td>Marine Microbial Ecology</td>
<td>Carpenter</td>
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<td>Marine Biology</td>
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<td>Obrebski</td>
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<td>Molecular Evolution &amp; Conservation</td>
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<td>Remote Sensing of Environment</td>
<td>Foschi</td>
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<tr>
<td>Restoration Ecology</td>
<td>Boyer</td>
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Fulfilling our mission depends on the generous support of many individuals: our Board of Directors, Foundations, and other friends. The Romberg Tiburon Center is grateful for their generosity.

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- National Science Foundation
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- The San Francisco Foundation
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- WM Keck Foundation

**In-Kind Donations**
- Maxwell Drever
Romberg Tiburon Center for Environmental Studies

Vision for the Future
Aerial View: Future Campus

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It is available online as a high resolution PDF file at www.rtc.sfsu.edu