



MATE
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CENTER



2008 MATE International ROV Competition

www.marinetech.org/rov_competition/index.php

Diving to the Deep: Uncovering the Mysteries of Mid-Ocean Ridges

June 2008

Scripps Institution of Oceanography–University of California, San Diego



GENERAL INFORMATION

Eligibility requirements, regional contests, financial assistance, and more

OVERVIEW

The **MATE Center** and the **Marine Technology Society's ROV Committee** are organizing the 7th annual MATE International ROV Competition. The event is being hosted by Ridge 2000 at Scripps Institution of Oceanography and the University of California, San Diego in June 2008. The competition theme focuses on hydrothermal vents found at mid-ocean ridges and the technologies used to study these deep-sea environments.

Employers (industry, businesses, government agencies, and research organizations) and working professionals are contributing to the event by donating funds, building materials, equipment, and facilities in support of the competing teams. Working professionals are also volunteering their time and technical expertise as mentors, technical assistants, and competition judges.

GOALS

- To increase the awareness and visibility of marine technical fields, educational and career opportunities, and potential employers.
- To help students develop the skills necessary to enter careers in technical fields. These skills include the ability to work as a team, problem solve, think critically, troubleshoot, communicate effectively, and manage projects.
- To connect students and educators with employers and working professionals. Working professionals have the opportunity to share their knowledge and experience as team mentors, complementing what students are learning in the classroom. Employers have the opportunity to evaluate students as potential employees, and students have the opportunity to explore potential careers.
- To increase students' understanding of mid-ocean ridges and the biological, chemical, geological, and geophysical oceanographic processes that drive them.

COMPETITION COMPONENTS

Each year the competition focuses on a new theme in order to expose students and educators to the many different aspects of the ocean workplace and the scientific and technological advancements that are taking place.

Regardless of the theme, the competition consists of the following components:

- Underwater mission tasks
- Technical reports
- Engineering presentations
- Poster displays

Information about the underwater missions can be found within the [Competition Missions](#) document, while the [Engineering & Communication](#) document contains information about the report, presentation, and display. The [Design & Building Specifications and Competition Rules](#) document contains information about ROV specifications and competition rules.

ELIGIBILITY – GENERAL

(See below for eligibility as it applies to specific competition classes)

- Open to middle school, high school, college, and university students.* Home-schooled students of comparable grade levels are also welcome.
- Graduate students are NOT eligible to compete as student team members, but are welcome to serve as team mentors or lead instructors. Graduate students are encouraged to contribute to the team via advice and technical assistance.
- Students can design and build the vehicles as an entire class project or school group activity. The group must be affiliated with a school or a home-school network and/or demonstrate that 1) the participating students are currently enrolled in a high school, college, university, or home-school network and 2) the students are working under the supervision of an adult mentor.
- Teams must have at least three students with at least one faculty member or adult advisor involved in the process. One student should be designated as the team spokesperson.
- The role of the faculty member or adult advisor must be limited to educational and inspirational support. Actual construction of the vehicle, particularly in the complex electrical and software areas, must be completed by the students. Students will be questioned extensively by the judges on their role in designing and building the ROV.
- Individuals from industry, businesses, research organizations, and/or government can act as mentors during the design and building process. The role of these individuals must be limited to technical guidance. Industry mentors should not participate in the actual construction of the vehicle.
- Teams are discouraged from using complete, commercially available, off-the-shelf, plug-and-play systems. Teams will not be disqualified from competing for using these types of systems, but the engineering evaluation and technical report score sheets will reflect MATE's effort to discourage the use of these systems. See the general rules section of the [Design & Building Specifications and Competition Rules](#) document for specific information.

- All team members are required to register or update their information on the MATE AlumniWeb site (www.marinetech.org/alumni) as a condition of participating in the competition. AlumniWeb helps the MATE Center to keep track of students who have participated in its ROV competitions and to demonstrate the impact of the competition program to its funding agencies. The information entered is kept strictly confidential. See the *Technical Report* section within the **Engineering and Communication** document for more information.

*Middle schools are eligible to compete in RANGER class only.

The competition organizers will review the registration forms and make the final decisions about participation. Students and/or instructors may be asked to verify that students are registered at a school, college, or university, or that the team is working under the supervision of an adult mentor.

COMPETITION CLASSES

There are two classes in which teams can compete – **EXPLORER** and **RANGER**. Teams can register to compete in **one** (but not both) competition class. Two teams per instructor will be considered as long as one team represents a high school or home school and the other a college or university. Institutions/instructors interested in entering one team per competition class will also be considered provided that they meet the eligibility requirements for both classes listed below.

EXPLORER class eligibility

- Participation in the EXPLORER class is open to community colleges, technical colleges, and universities.
- High schools can apply to compete in the EXPLORER class. See the competition registration form for details. The registration form will be posted to the competition web site by December 1st, 2007.
- High schools that have previously competed in the EXPLORER class must also apply, making sure to indicate the total number of returning team members. See the competition registration form for details.

IMPORTANT CHANGE FOR 2008:

EXPLORER class teams are required to demonstrate that their vehicle is operational prior to the international competition. This can be accomplished in one of two ways:

1. EXPLORER class teams within a reasonable driving distance* to a regional contest must attend that regional contest on the date of the event to demonstrate to the regional coordinator (or other designated competition official) that their vehicle can maneuver under its own power underwater. “Maneuver under its own power underwater” means that the vehicle can:
 - Descend
 - Move forward the length of the tether
 - Move backward the length of the tether
 - Turn right and left

- Ascend

The regional coordinator will contact the EXPLORER class teams within his or her region to arrange a time during the regional event for this demonstration to take place. The regional coordinator will then submit an e-mail to the MATE competition coordinator verifying that the team's vehicle can accomplish the items listed above. If the team's vehicle cannot accomplish these items, the team is not eligible to participate in the international competition.

2. EXPLORER class teams beyond a reasonable driving distance* to a regional contest must notify the MATE competition coordinator so that an alternative verification plan can be arranged. For example, the MATE competition coordinator will seek out an impartial individual, such as a member of the Marine Technology Society or the Institute for Electrical and Electronics Engineers Oceanic Engineering Society, and make arrangements with him or her to visit the team at their school or practice location for the demonstration. The demonstration must be completed by the date of the final regional contest of the 2008 competition season. This exact date is TBD but will be confirmed in January 2008.

*To be determined on a case-by-case basis through discussions with the MATE competition coordinator.

RANGER class eligibility

- Participation in the RANGER class is open to high schools, middle schools, and home schools.
- Community colleges, technical colleges, and universities competing for the first time are also eligible to participate in the RANGER class.
- Schools in the vicinity of one of the 17 regional contests are required to participate in the regional in their area before moving on to the international competition. (See below for information about the regional contests.)

Please see the [Competition Missions](#) and [Design & Building Specifications and Competition Rules](#) documents for detailed information about the competition classes. You can also visit the competition's web site at www.marinetech.org/rov_competition/index.php.

INTERNATIONAL COMPETITION VENUE

The 2008 international competition is being hosted by Ridge 2000 at Scripps Institution of Oceanography and the University of California, San Diego June 2008.

What is Ridge 2000?

Ridge 2000 is an interdisciplinary research program sponsored by the National Science Foundation that focuses on integrated studies of Earth's seafloor spreading centers. The program coordinates research studies of deep-sea hydrothermal vents and rifting of volcanic crust, with emphasis on links between biological, chemical, geological, and

geophysical oceanographic processes. State-of-the-art, deep-sea technologies are a key component of Ridge 2000 work, including instruments and vehicles that are moored, towed, remotely-operated, and manned.

Ridge 2000 research is conducted using two complementary approaches. The first approach, known as **integrated studies**, brings scientists from different disciplines together to study seafloor spreading centers as ecosystems at locations chosen by the Ridge community. By working together, the scientists can develop a much better understanding of the complex relationships between the geology, chemistry, biology, and physics that define these unique ecosystems. Currently, research is underway at three study sites in the Pacific Ocean:

1. Endeavour Segment of the Juan de Fuca Ridge – an intermediate-spreading ridge with a high density of hydrothermal venting
2. East Pacific Rise (8° - 11° N) – a fast-spreading ridge where a seafloor volcanic eruptions have been detected in 1991 and 2006
3. East Lau Basin Spreading Center – site of the first coordinated study effort of a back-arc spreading center

The second approach, known as **time critical studies**, allows scientists to respond rapidly when unique and interesting (and often unpredictable) events happen at the study sites. For example, if a large volcanic eruption happens on the seafloor at a spreading center, scientists will want to get there as quickly as they can to observe the immediate biological, chemical, and geological consequences of the event. Rapid response cruises have occurred at the Endeavour study site and, most recently, at the East Pacific Rise study site in response to a seafloor eruption believed to have occurred in early 2006.

The Ridge 2000 program also includes an education and outreach component that works to bring exciting ridge science to the public and K-12 audiences, including the students and educators participating in the 2008 MATE ROV competition.

For more information about the Ridge 2000 program visit www.ridge2000.org.

Scripps Institution of Oceanography – University of California, San Diego

Scripps Institution of Oceanography is one of the oldest, largest, and most important centers for marine science research, graduate training, and public service in the world. Its preeminence in marine and earth sciences is reflective of its excellent programs, distinguished faculty and research scientists, and outstanding facilities.

Scripps Institution was founded in 1903 as an independent biological research laboratory. It became part of the University of California in 1912. At that time the laboratory was given the Scripps name in recognition of supporters Ellen Browning Scripps and E. W. Scripps. In the 1960s, Scripps director Roger Revelle joined with community leaders to create University of California, San Diego, now one of the nation's foremost academic and research universities.

Research at Scripps encompasses physical, chemical, biological, geological, and geophysical studies of the oceans. Ongoing investigations include the topography and composition of the ocean bottom, waves and currents, and the flow and interchange of matter between seawater and the ocean bottom or the atmosphere. Scripps's research ships are used in these investigations throughout the world's oceans.

More than 300 programs may be under way at any time, including studies of air-sea interaction, climate prediction, earthquakes, the physiology of marine animals, marine chemistry, beach erosion, the marine food chain, the ecology of marine organisms, the geological history of the ocean basins, and the multidisciplinary aspects of global change and the environment.

Scripps operates a fleet of four ships and the platform FLIP for oceanographic research. Cruises range from local trips to far-reaching expeditions in the world's oceans.

Scripps staff numbers approximately 1,300, including about 90 faculty members, nearly 300 other scientists, and some 200 graduate students.

For more information about the Scripps Institution of Oceanography, visit <http://sio.ucsd.edu>. For more information about the University of California, San Diego, visit www.ucsd.edu.

RANGER REGIONAL CONTESTS

In 2008, the MATE Center is supporting and helping to organize 17 regional contests in the U.S., Canada, Hong Kong, and Scotland. These regionals serve as feeders into the international competition's **RANGER** class, with the top one or two teams from each regional contest advancing to the international competition. For example, the top ONE team from regionals with 10 or less individual SCHOOLS participating will advance to the international competition, while the top TWO teams from regionals with more than 10 individual SCHOOLS participating will advance to the international competition.

The following regional events will take place in 2008:

- ▼ **Big Island** (Hilo, Hawaii)
- ▼ **Florida** (Tampa, Florida)
- ▼ **Great Lakes** (Alpena, Michigan)
- ▼ **Hawaii Underwater Robot Challenge** (Oahu, Hawaii)
- ▼ **Hong Kong** (Hong Kong)
- ▼ **Mid-Atlantic** (Hampton, Virginia)
- ▼ **Monterey Bay** (Monterey, California)
- ▼ **New England** (Buzzards Bay, Massachusetts)
- ▼ **Newfoundland & Labrador** (St. John's, Newfoundland and Labrador)
- ▼ **Northern California** (Arcata, California)
- ▼ **Nova Scotia** (Halifax, Nova Scotia)
- ▼ **Pacific Northwest** (Seattle, Washington)
- ▼ **Scotland** (Aberdeen, Scotland)

- ▼ **Southern California Fly-Off** (San Diego, California)
- ▼ **Southeast** (Savannah, Georgia)
- ▼ **Southwest** (Phoenix, Arizona)
- ▼ **Texas** (Houston, Texas)

Schools within the vicinity of a regional contest are required to participate **in the regional in their area** in order to move on to the international competition. If you are uncertain about which, if any, regional your school should participate in, contact Jill Zande, MATE's Competition Coordinator, at jzande@marinetech.org or (831) 646-3082.

For more information about the **RANGER** regional contest nearest you, visit www.marinetechnology.org/rov_competition/2008/regional_contests.php.

KEY MILESTONES AND SCHEDULE OF EVENTS

Key milestones:*

- November 1st – design specs, competition rules, and mission tasks posted
- December 1st – on-line registration form posted
- **February 1st – on-line registration deadline**
- March 1st – application for travel assistance posted
- May 31st – deadline for submitting application for travel assistance
- June 1st – technical reports due to MATE competition coordinator
- June 26th – 28th – international competition held at Scripps Institution of Oceanography and the University of California, San Diego
 - Engineering & poster presentations due

*Note: These are milestones that apply to the international competition **only**. Regional contests are held prior to the international event and may have their own sets of key milestones, including their own registration deadlines. See www.marinetechnology.org/rov_competition/2008/regional_contests.php for information specific to the regional contests.

Schedule of international competition events:

*****Example*****

- Wednesday – teams arrive & check-in
 - Vehicles shipped or hand-carried to competition venue
 - Facility tours for those interested
- Thursday – set-up & pool practice day
 - Welcome & introductions in morning
 - Set-up team workstations & posters, competition arena, and repair station
 - Practice time available
 - Evening social mixer/reception (**attendance required**)
- Friday – engineering presentations & underwater missions
 - Engineering evaluation interviews
 - Teams have scheduled time slots
 - Underwater mission challenges begin
 - Teams have scheduled time slots

- Free time and optional facility tours when not competing
- Saturday – underwater missions & awards
 - Underwater mission challenges continue
 - Teams have scheduled time slots
 - Free time and optional facility tours when not competing
 - Evening awards ceremony
- Sunday – teams depart

FUNDING AND BUDGET

There is no limit to the amount of money, time, and technical expertise that can go into designing and building your team's vehicle. However, keep in mind that a costlier vehicle does not necessarily mean that the vehicle will perform better or will be better able to successfully accomplish the mission tasks.

The MATE Center offers each team the following support:

- **Financial assistance (up to \$1,000) with travel and lodging expenses.**
Teams participating in the international competition can apply for funds (up to \$1,000) to help offset the cost of travel and lodging for STUDENT team members. The application for financial assistance will be posted to the competition web site by March 1st, 2008.

Note: Travel funds and/or lodging accommodations may be available for teams competing in regional events; teams should contact the regional contest coordinator in their area for more information.

- **Meals – kick-off reception, lunches, and awards banquet.**
A kick-off reception, lunches each day of the event, and an awards banquet will be provided to student team members, instructors, and mentors attending the international competition. Parents, spouses, siblings, cheerleaders, etc. will be able to purchase tickets for the reception and awards banquet (but **NOT** lunches) in advance.

Note: Meals may be provided to teams competing in regional events; regional teams should contact the regional contest coordinator in their area for more information.

- **Special offers from competition sponsors.**
Several companies offer their products, materials, supplies, and/or access to equipment and facilities to competition teams at no or reduced costs.

For example, VideoRay's "MATE ROV Competition Store" is available to competition teams **only**. This on-line store offers discounts on cameras, tethers, and, possibly, thrusters, among other items. Carrillo Underwater Systems (CUS) offers a scholarship for free and/or discounted products, and Sound Ocean Systems, Inc. offers free umbilical cable provided teams cover shipping costs.

SolidWorks provides student edition versions of its software to ALL student members of MATE ROV teams at no cost. Igus, Inc., offers a range of its products at no-cost, while VANTEC, Lights Camera Action LLC, and Parallax (*new in 2008!*) offer discounts on certain products.

Information about these offers and others is included within the “teams’ only” section of the competition web site (see the bullet below for more information about how to access this site).

- **Resources and “teams’ only” sections of the ROV competition web site.**

The resources section of the ROV competition web site located at www.marinetech.org/rov_competition/resources.php contains information on where to purchase building materials, lists of helpful web site and books, and a “teams’ only” password protected area, among other resources.

The URL for VideoRay’s on-line store, CUS scholarship program, etc., and other information and support available only to MATE competition teams are posted within the “teams only” section. Information on potential funding sources at both the international and regional level (e.g., local Rotary Clubs, American Association of University Women, etc.) is also included there. Teams will receive the username and password to access the teams’ only section once their registration has been accepted.

- **Access to industry mentors.**

The MATE Center and the regional coordinators work to connect students with industry professionals willing to donate their time and technical expertise as team mentors. Several regionals have developed extensive mentor networks utilizing members of their local MTS section, for example. Contact the MATE Center or the regional coordinator in your area if you are interested in connecting with an industry mentor.

- **Additional costs.**

Teams are encouraged to organize their own fundraising activities to cover building materials and travel, housing, and meal costs above and beyond what the MATE Center provides. The “teams’ only” section of the ROV competition web site includes a letter from MATE’s competition coordinator that teams can use to approach local businesses (e.g., Home Depot) for donations of funds, materials, equipment, etc.

In addition, the following items are your team’s responsibility:

- Shipping your ROV system and tools to competition venue. **Note:** The MATE Center is pursuing discounted shipping rates. Stay tuned for more information.
- Costs associated with fundraising or presentations to community.
- Miscellaneous expenses for photocopying, phone calls, shipping costs associated with ordering ROV components, mailings, courier, etc.