

Collaborative Autosub Science in Extreme Environments (CASEE)

Opportunities for Young Researchers – International Exchange

www.noc.soton.ac.uk/CASEE

CASEE is a 3-year Natural Environment Research Council International Opportunities Fund project, that started in 2005, aimed at enhancing the international reputation of the NERC Autosub autonomous underwater vehicle programme and building on its science achievements. It will help sustain an international presence for the science, and provide a bridge between the [Autosub Under Ice](#) directed programme and future opportunities such as [International Polar Year](#) through:

- A Masterclass and a separate Science Workshop in environmental science and technology using autonomous underwater vehicles.
- Twelve competitive placements, to enable young UK and overseas scientists and engineers to develop lasting collaborative links.
- Sponsorship of sessions and poster receptions at major international conferences
- Outreach to young people and their educators worldwide through a web-conference arranged through the College for Exploration.

Young researcher bursaries

Many of the demonstrable successes of the [Autosub](#) programme have arisen through scientists and engineers working closely together. It is one of the strengths of the project that this link exists with both sides pushing progress into mutually beneficial directions. We propose to drive this link on by funding a series of 12 money-capped competitive bursaries of up to £UK5,000 in value to cover or contribute to the expenses of the collaboration. They will be specifically for younger scientists and engineers (those not yet 35) to travel and collaborate for a specific project. The bursaries will be available to UK researchers to spend time overseas and for overseas researchers to spend time with UK groups. *(Preliminary enquires to work with the Southampton Autosub team should be addressed to kjc@noc.soton.ac.uk)*

Objectives

Our objectives would be to bring together young researchers from outside and inside the UK that were not currently working together in the fields of polar marine science and technology to begin lasting partnerships and collaboration.

Application Closing Date:

31st March 2006

(a second call is anticipated in January 2007)

Applications to be sent by post or email to:

Dr Ken Collins

School of Ocean and Earth Science, University of Southampton, National Oceanography Centre, Southampton SO14 3ZH, U.K.

tel&fax: +44 (0)23 80 596010

email: kjc@noc.soton.ac.uk

Selection

The recipients of these bursaries will be chosen by the Project Steering Group, on the basis of the completed pro forma below.

Successful applicants will be contacted by the end of May 2006.

Half the bursary will be offered in advance.

Successful applicants will be required to submit diary reports during their visit, which will be mounted on the CASEE site. The balance of the bursary will be paid on completion of the collaboration and receipt of a final report

**Collaborative Autosub Science in Extreme Environments
Young researcher bursary application form**

APPLICANT'S DETAILS

Title: Dr.

First Name: Arthur

Surname: Trembanis

Date of Birth (*age < 35*): Oct. 13th, 1975 (30)

Address: 351 S. College Ave. Newark, DE

Email: art@udel.edu

Telephone: 1.302.831.2498

Fax: 1.302.831.4158

Nationality: USA

Academic title (*max 130 characters*): Assistant Professor and Director of CSHEL

Department: Geology

Start date of present employment: Sept. 2005

Field of specialisation (*max 100 characters*): Coastal Geomorphology, Sediment Dynamics and Scour Processes

Statement of academic qualifications & career (*max 1,600 characters, list posts and dates*)

Statement of Qualification

Arthur Trembanis is the founding director of the Coastal Sediments, Hydrodynamics, and Engineering Laboratory (CSHEL) at the University of Delaware. He received his B.S. magna cum laude from Duke University, completed a Fulbright fellowship at Sydney University, and received his Ph.D. from William and Mary/VIMS. His research interest deals with the measuring and modeling of coastal morphodynamics particularly beach erosion, beach nourishment, bedform behavior and scour processes associated with seafloor objects (shipwrecks and mines). His research efforts cross many sub-disciplines including geomorphology, scour processes, boundary layer hydrodynamics, sedimentary geology, exploration geology, marine archaeology, forecast numerical modeling, autonomous underwater vehicles, and the development of coastal observing systems. He has extensive experience in conducting and analyzing complex field studies from sites around the world.

Academic Preparation

Duke University, Geology, B.S., 1998

College of William and Mary (VIMS), Ph.D., 2004

Woods Hole Oceanographic Institution, Postdoctoral Fellow, 8/04-6/05

Career Positions

Assistant Professor of Geology

(7/05 to present)

Department of Geology

University of Delaware, Newark DE

Post-doctoral Fellow (8/04-6/05)

Applied Ocean Physics and Engineering Department

Woods Hole Oceanographic Institution

Woods Hole, MA

Software Engineer/Geophysical Scientist (1/04-8/04)

Sias Patterson Inc. makers of the Fetch® class AUVs

Yorktown, VA

Fulbright Fellow (8/98-7/99)
Coastal Studies Unit
Sydney University
Sydney, NWS Australia

List of publications (*max 1,600 characters provide details of five of your recent publications*)

- Trembanis, A.C., C.T. Friedrichs, M. Richardson, P.A. Traykovski, and P. Howd, in press, anticipated publication Fall 2006. Predicting Seabed Burial of Cylinders by Wave-Induced Scour: Application to the Sandy Inner Shelf off Florida and Massachusetts. *Ocean Engineering*.
- Mayer, Larry A., R. Raymond, G. Glang, M. D. Richardson, P. A. Traykovski, and A. T. Trembanis, High-resolution mapping of mines and ripples at the Martha's Vineyard Coastal Observatory, in press, anticipated publication Fall 2006. *Ocean Engineering*.
- McNinch, J.E., Trembanis, A.C., and Wells, J., in press, anticipated publication Summer 2006. A Scour Model for Shipwrecks and Marine Artifacts- Developing and Testing a Predictive Tool for Nautical Archaeologists. *International Journal of Nautical Archaeology*
- Richardson, M.D., E.F. Braithwaite, S. Griffin, J. Bradley, C.T. Friedrichs, and A.C. Trembanis, 2004. Real-time characterization of mine scour burial at the Martha's Vineyard Coastal Observatory. Proceedings of the Sixth International Symposium on Technology and the Mine Problem, 9-13 May 2004, Naval Postgraduate School, Monterey, CA.
- Trembanis, A.C., Wright, L.D., Friedrichs, C.T., Green, M.O., Hume, T.M. 2004. The Effects of Spatially Complex Inner Shelf Roughness on Boundary Layer Turbulence and Current and Wave Friction: Tairua Embayment, New Zealand. *Continental Shelf Research* vol. 24 pp. 1549-1571.

Present research (*max 1,000 characters, an outline summary*)

- Pilot Study on the Use of Terrestrial LIDAR for Rapid, High-Resolution Beach Monitoring- sponsor DNREC
- Forecasting Scour Processes Associated with Shipwrecks and Seabed Mines- sponsors ONR, Seagrant
- Formation and Maintenance of Rippled Scour Depressions/Sorted Bedforms- sponsors NSF, USGS
- Development and testing of a small coastal mapping AUV- sponsors UD, NOAA

Previous grants (*max 500 characters*)

- Prototype of New Peer into the Waterways Information Network*
Sponsor: US Coast Guard
- Forecasting scour related mine burial using a parameterized model*
Sponsor: Office of Naval Research
- The role of spatially complex shoreface roughness in sediment transport and deposition: A New Zealand case study and model development.*
Sponsor: National Science Foundation
- Beach rotation and Southern Oscillation, Narrabeen NSW Australia*
Sponsor: Fulbright Foundation USIAA

HOST'S DETAILS

Title: Professor
First Name: Gwyn
Surname: Griffiths
Address: National Marine Facilities
National Oceanography Centre, Southampton
Waterfront Campus
European Way
Southampton SO 14 3ZH

UK

Email: gxg@noc.soton.ac.uk

Telephone: +44 (0) 23 8059 6004

Fax: +44 (0) 23 8059 6149

Department: Underwater Systems Laboratory

Institution Name and address:

Field of specialisation (*max 100 characters*)

VISIT INFO

Dates: July 16-30, 2006

Title of proposed research (*max 80 characters*): *Reliability, Risk, and Mitigation for small AUVs*

General purpose (*max 4,500 characters*):

AUVs of many sizes and configuration are experiencing increased utilization in the oceanographic and geophysical survey communities for a wide array of industry, defense, and scientific applications, yet very little is known about the reliability and failure risks of the systems. While some recent studies and reports have examined reliability and risk assessment for large class AUVs notably the Autosub, C-Surveyor, Dorado vehicles (e.g. Griffiths *et al.* 2003a and 2003b), a similar systematic and quantitative analysis for small AUVs have not been conducted. Given the generally greater number of small AUVs in existence and use, such vehicles (e.g. Remus, Gavia, Fetch, etc.) may present a significant new opportunity to assess system reliability and risk. I propose to conduct a reliability and risk assessment study in collaboration with Prof. Gwyn Griffiths at NOC, Southampton. I will focus my initial analysis on Fetch® class AUVs especially the new Fetch3.5 vehicle DOERRI owned and operated by the University of Delaware Coastal Sediments Hydrodynamics and Engineering Lab (CSHEL). Where sufficient data is made available I will attempt extend the analysis to other small AUVs such as Gavia, Remus, and Bluefin 9 and 12 vehicles.

I recognise that CASEE focuses on extreme environments, where AUVs are particularly at risk. I do in fact have plans and aspirations to engage DOERRI in polar environment missions, though to date only one Fetch® vehicle operated by my colleague Mark Patterson has undergone use in polar settings. Most of DOERRI's missions, however, have and will be in nearshore mid and low-latitude settings. The near shore environment can indeed be one where there is additional risk to an AUV, especially a small AUV. Therefore, the approach and methodologies that have been applied at Southampton to assessing and quantifying risk will be transferable to my own main area of application of AUVs.

Description of Vehicle-

The new CSHEL autonomous underwater vehicle, DOERRI, and sister Fetch® AUVs will be used as test case material for reliability, risk assessment and mitigation for small AUVs. DOERRI is a small AUV with a diameter of 35 cm, an overall length of 2.1 m and a weight in air of 98 kg. The plan is to analyse the previously and ongoing mission data collected by DOERRI and other Fetch® class vehicles to explore systems reliability. The AUV has a suite of sensors including conductivity, temperature, depth (CTD), acoustic Doppler current profiler (DVL/ADCP), GPS, and high-resolution side-scan sonar. Furthermore, a host of new upgrades are in the works for DOERRI and systems performance data following upgrade will also be used to assess the effects of upgrades on system reliability following the methodology employed by Griffiths *et al.* (2003b).

Aim of project and application of results-

Preliminary effort- Utilizing existing industry and agency associations and partnerships I will work on data gathering and assessment prior to arrival in Southampton. This precursor effort will maximize the time spent on the ground in Southampton allowing us to focus our efforts on data analysis and interpretation. It is envisioned that the results of this collaborative effort will include a presentation at

an international conference, a detailed summary report, and possible development of a journal manuscript. We will convey our findings to administrators both at our respective institutions (Univ. Delaware and Univ. Southampton) and to various agencies (NERC, NOAA, ONR, etc.), as well as to participating industry partners.

Literature cited-

- Griffiths, G., Millard, N. W., McPhail, S. D., Stevenson, P. and Challenor, P. G., 2003(a). On the Reliability of the Autosub Autonomous Underwater Vehicle. *Underwater Technology* 25(4): 175-184.
- Griffiths, G., Millard, N. W., McPhail, S. D. and Riggs, J., 2003b. Effect of upgrades on the reliability of the Autosub AUV. Proc. UUST 2003, AUSI, New Hampshire.

Previous contact (*max 500 characters, are you already acquainted with the host?*):

I am acquainted with the host (Prof. Griffiths) having met initially on the beach in Waikiki and then having attended the AUV technology masterclass at NOC in April 2006. I have contacted Prof. Griffiths and discussed the proposed project and secured his interest and scheduling commitment for the effort (see attached Reference).

REFERENCES

(These can be emailed directly to the CASEE programme manager Dr Ken Collins

kjc@noc.soton.ac.uk)

Statement from Referee (*e.g. head of applicant's research group/department, supporting the application*)

Statement from Host (*indicating that they are willing to provide facilities for the duration of the visit. Any charges the host may make should be included in the Financial Details - 'Other' below*)

FINANCIAL DETAILS

Proposed Expenditure (*max 200 characters, up to £UK5000, provide details and the requested amounts*)

- Travel – airfare: \$1100 USD accommodation: \$120USD/day for 13 days ground transportation: \$200 USD (Taxi to/from Heathrow)
- Subsistence- per diem \$50 USD/day for 14 days
- Other- publication costs/conference submission: \$500 USD

Total: \$3860USD = £UK 2202 as of April 6th, 2006 (1 USD=0.570465 GBP)