MARINE TECHNOLOGY REPORTER

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Interview with new Hydroid President

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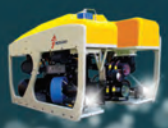







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On the Cover

The wreck of U390 sunk on July 5, 1944 by HMS Tavy and HMS Wanderer using the hedgehog forward firing mortar. Credit: Image provided by MC4, LCL Production, and Sherrell Ocean Services, created with Measutronic's R2Sonic 2024 UHR Multibeam Sonar.

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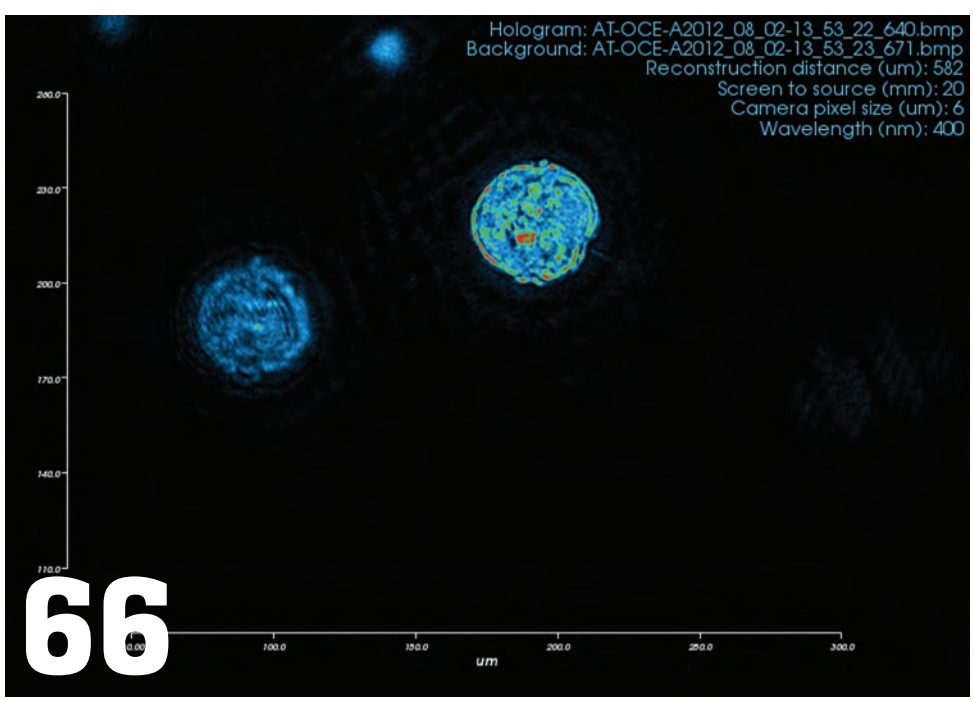

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This year's OCEANS conference, ***Where Challenge Becomes Opportunity***, is bringing together global and community leaders in government, science, engineering, enterprise and industry –– making it one of the most comprehensive ocean science and engineering gathering in North America. It will feature tutorials, multiple tracks of technical sessions, keynote speakers, receptions, public exhibit halls, a Gala at The Rooms – the provincial museum and archives, and events to enjoy before and after the conference.
We are currently calling for technical papers and posters, and student competition posters, in the form of abstracts due March 26, 2014. For complete details on topics, eligibility and submission visit us at: www.oceans14mtsieeestjohns.org/main.cfm/EID/32/Information-Brochures/
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(U.S. Navy photo by Mass Communication Specialist 2nd Class Blake Midnight/Released)

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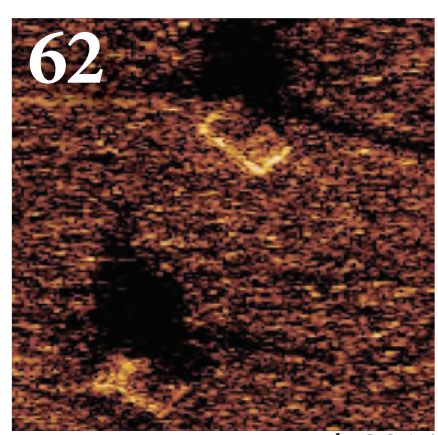

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Clarification

In the October 2013 feature "From Learning to Earning" which documents the role of Scripps Institution of Oceanography in developing technologies that evolve into commercial entities, there is a clarification regarding the information on Quad Geometrics. The clarified paragraph is below.

Quad Geometrics
With a profound understanding of the oceans and the atmosphere, Scripps has a lot to offer companies looking for ways to find and understand oil and gas deposits deep within the earth. With that same interest in mind, Quad Geometrics, LLC, another recent Scripps startup, was cofounded by Mark Zumberge, Ph.D., Research Geophysicist and head of the Gravity Lab at the Institute for Geophysics and Planetary Physics, to provide products and services that precisely measure key earth parameters such gravity, sound, pressure and vibration. Quad Geometrics takes technology developed through decades of research in the North Sea and other areas of intense oil and gas exploration, and brings it to the commercial marketplace. The instruments, licensed to Quad Geometrics by the University of California, San Diego, show changes in density under the seafloor so drilling companies can see what's happening underground as the oil and gas are pumped out. Changes in gravity measurements help extraction companies understand and maintain the balance between remaining oil and gas, empty space and the water used to backfill the voids created by the pumping activity.
Information on how much product remains in a reservoir is potentially worth hundreds of millions of dollars to these companies. Quad Geometrics' instruments can give a clear picture of the underground/underwater topography showing how much or how little viable product is sitting below the sea. As companies attempt to squeeze out the maximum from each well, such technologies can measure the reservoir to see if it's cost effective to continue pumping or time to stop.
Prof. Steven Constable directs the Marine Electromagnetism (EM) Laboratory at Scripps and established the Seafloor Electromagnetic Methods Consortium (http://marineemlab.ucsd.edu/semc.html), which has attracted the support of leading oil and gas companies and specialized geophysical services providers that benefit from the laboratory's world-class expertise and access to cutting-edge instruments developed over decades by the EM Lab.

Authors

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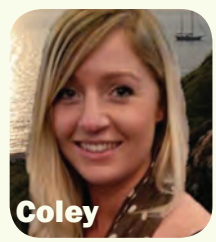

Kira Coley graduated with a BSc. (Hons) Marine Biology degree from University of Portsmouth and has extensive experience as a Field Scientist in various locations including Madagascar, Sicily, and Scotland. She joined Planet Ocean Ltd in 2013 as a science liaison between Planet Ocean and its principals. *p. 44*

Edward Lundquist is a retired naval officer who writes on naval, maritime, defense and security issues. He is a regular contributor to Maritime Reporter and Marine Technology Reporter. *p. 22 & 38*

Jeremy Dillon holds a PhD in physics and physical oceanography from Memorial University of Newfoundland, as well as master's degrees in mathematics and aeronautics from Carleton University and Caltech, respectively. Previously, he was an instrumentation engineer with the Flight Research Laboratory of the National Research Council Canada specializing in inertial/GPS navigation and distributed real-time systems. *p. 62*

Tom Peters is a freelance writer living in Lower Sackville, Nova Scotia, a suburb of Halifax. He is retired from the newspaper business after 41 years with The Halifax Chronicle-Herald where he held several editorial positions during his career. In his last 10 years at the paper he was a business reporter with a strong focus on the marine industry. *p. 66*

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The subsea industry is an amazingly complex and robust industry, offering solutions to some of the world's most difficult problems from some of the smartest people on the planet. But while the solutions are complex, the premise is rather simple. Devising a means to 'see' more clearly and work more efficiently underwater, as well as process more effectively the gargantuan amounts of data recovered. Easier said than done, of course, but take for example our cover story on the recent D-Day mapping mission. It has been almost 70 years since and a massive survey and archeological effort is underway to honor those who served. Today, through some of amazing technological advances, emerge some of the clearest images ever of the underwater remnants of that fateful day. For more turn to page 56.

Turning the pages, **Kira Coley** of Planet Ocean writes for us an enlightening article on "Acidic Oceans," starting on page 44. The general health and welfare of the oceans and the entire aquatic environment is a hot topic today and for generations to come. Looking across the industry at the general maritime market, environmental initiatives are quite literally spinning the collective industry on its head, as ship and boat owners today are more than ever required to comply with exacting and stringent limits on what they can and cannot put into the air and the water. Quite simply the technologies developed and deployed provide a far clearer 'big picture' in this regard, and Coley in her article documents the latest monitoring solutions available for the task at hand. How will this technology develop in the coming years? That is the question the XPRIZE foundation has taken on, announcing recently that it has partnered with the Wendy Schmidt Foundation to launch a $2m 'Wendy Schmidt Ocean Health XPRIZE' to spur global innovators to develop ocean pH sensors to transform our understanding of ocean acidification. Full details on the contest and your potential role starts on page 52 in the story *"X Prize Marks the Spot."*

Finally, for any of you attending or exhibiting at Oceanology in London, I invite you to the *Marine Technology Reporter* stand A109 to share with our editorial team, which will be out in force, news and information on your recent works and new technology.

MARINE TECHNOLOGY REPORTER
www.seadiscovery.com
Vol. 57 *No. 2*
ISSN 1559-7415
USPS# 023-276
118 East 25th Street,
New York, NY 10010
tel: (212) 477-6700;
fax: (212) 254-6271

Marine Technology Reporter ISSN 1559-7415 is published monthly except for February, August, and December by New Wave Media, 118 E. 25th St., New York, NY 10010-2915. Periodicals Postage at New York, NY and additional mailing offices.

POSTMASTER: Send address changes to Marine Technology Reporter, 850 Montauk Hwy., #867, Bayport, NY 11705
Postmaster send notification (Form 3579) regarding undeliverable magazines to Marine Technology Reporter, 850 Montauk Hwy., #867, Bayport, NY 11705

Publishers are not responsible for the safekeeping or return of editorial material.

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Satellite being used to Count Whales

New satellite technology is being used to count whales, and estimate their population size. Using Very High Resolution (VHR) satellite imagery, alongside image processing software, researchers were able to automatically detect and count whales breeding in part of the Golfo Nuevo, Peninsula Valdes in Argentina. The new method could revolutionize how whale population size is estimated. Marine mammals are extremely difficult to count on a large scale and traditional methods, such as counting from platforms or land, can be costly and inefficient. "This is a proof of concept study that proves whales can be identified and counted by satellite. Whale populations have always been difficult to assess; traditional means of counting them are localized, expensive and lack accuracy. The ability to count whales automatically, over large areas in a cost effective way will be of great benefit to conservation efforts for this and potentially other whale species," said Peter Fretwell from the British Antarctic Survey (BAS).

Previously, satellites have provided limited success in counting whales but their accuracy has improved in recent years. The BAS team used a single WorldView2 satellite image of a bay where southern right whales gather to calve and mate.

Whales in the image were manually identified and counted, finding 55 probable whales, 23 possible whales and 13 sub-surface features. Several automated methods where then tested against these numbers. A 'thresholding' of the Coastal Band of the WorldView2 image gave the greatest accuracy.

This part of the image uses light from the far blue end of the spectrum, which penetrates the water column deeper and allows us to see more whales. This technique found 89% of probable whales identified in the manual count. This is a semi automated technique that needs some user input to identify the best threshold. Future satellite platforms will provide even high quality imagery and Worldview3 is planned to be launched this year. This will allow for greater confidence in identifying whales and differentiating mother and calf pairs. Such technological advancements may also allow scientists to apply this method to other whale species.

Excerpted from a post by Claudio Paschoa on **SeaDiscovery.com**

OSV Market

Brazil Offshore Remains a Driver for New Boats

In the wake of the Subsea Vessel Brazil conference in Rio, Petrobras announced the approval to contract eight support vessels for its offshore activities. These are part of the 3rd Fleet OSV Renewal Plan (Prorefam). This is the 5th round and 4 vessels will be contracted from Bram Offshore, to be build at the Navship shipyard in the state of Santa Catarina, 3 from Starnav, with construction planned for the Detroit shipyard, also in Santa Catarina and 1 from Norskan, which will be built at the STX (Vard) shipyard in Niteroi, across the bridge from the city of Rio, where the Dof and Nordskan build all their Brazilian flagged ships.

This is good news for the shipyards involved and for the OSV market in general, as the Brazilian offshore maritime market is heavily dependent on Petrobras orders. At the start of the Subsea Vessel Brazil event, Daniel Del Rio, Managing Director of Westshore do Brasil, the local specialist on subsea vessels, gave a very enlightening presentation forecasting the future of the Brazilian subsea vessel market and it highlighted this dependency on Petrobras, with only 6 vessels on order not being for Petrobras. These were for Shell, Chevron and HRT, 1 of the vessels will be for subsea intervention and the rest are specialized IMR vessels.

The Prorefam project was launched in 2008 and contains plans to contract 146 vessels in total, over 7 rounds. The local content required for the construction phase is 50% for Anchor Handling and Tug Supply (AHTS) models, and 60% for Platform Supply Vessels (PSV) and Oil Spill Response Vessels (OSRV) models. 87 vessels had already been contracted before this round andproposals for the 6th round of contracts were received on February 4, and are currently undergoing technical review.

Excerpted from a post by C. Paschoa on **SeaDiscovery.com**

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By MacArtney

Europe's Seas Under Threat

Many of Europe's marine species, habitats and ecosystems have been under threat for decades. As maritime economic activities are predicted to increase in coming years, a new briefing from the European Environment Agency (EEA) argues that the cumulative impact of human activity should be better managed to avoid irreversible damage to ecosystems.

Many European industries have growing cumulative impacts on the sea, including transport, fishing, offshore energy and tourism. 'Marine messages' highlights the vulnerable nature of Europe's marine ecosystems, which may be irreversibly damaged if they continue to be exploited beyond sustainable limits. European countries need better information to help them understand the nature of these limits, the briefing says.

The publication is being launched to support the HOPE marine conference on March 3-4, 2014. Hans Bruyninckx, EEA Executive Director said, "The rich life in Europe's seas is an incredible asset. But we must ensure that this asset is used in a sustainable way, without surpassing the limits of what the ecosystems can provide. The current way we use the sea risks irreversibly degrading many of these ecosystems."

Approximately two fifths of the EU's population – 206 million people – live in a coastal area, and 23 of 28 Member States have a coastline. According to analysis from the European Commission, Member States must make urgent efforts and improve cooperation for the marine environment to reach good status by 2020, a target under the Marine Strategy Framework Directive (MSFD).

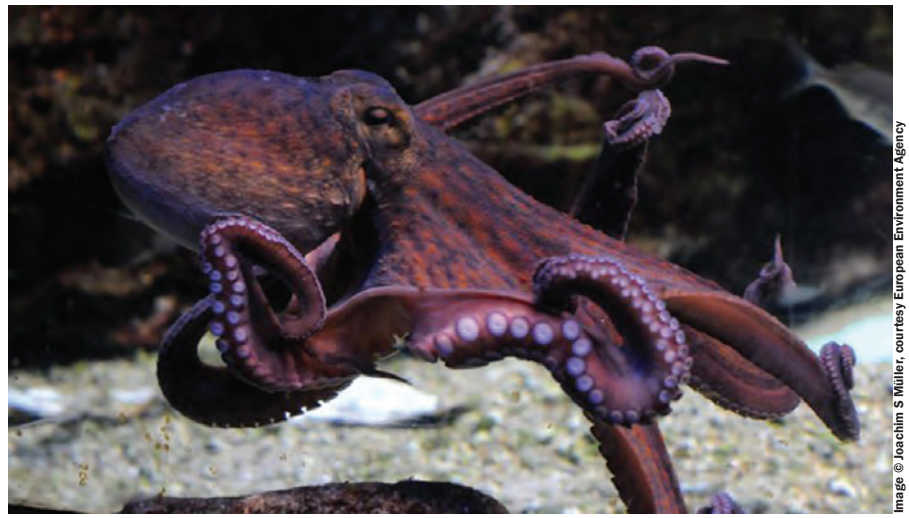

Image © Joachim S Müller, courtesy European Environment Agency

Europe's Marine Ecosystems

Marine ecosystems are in a poor state of health in many areas, the EEA briefing says. There are more than 36 000 known animal and plant species in the European seas. Species surveys have found that 'good environmental status' can be applied to less than a fifth of species and a similar proportion of habitats.

Different seas face different problems. Eutrophication is leading to oxygen-free 'dead zones' in the Baltic and Black Seas, while trawling has been most destructive of the seabed in the North Sea. The Mediterranean is under pressure from a range of factors, many of them related to fishing and tourism.

In the last 25 years, sea surface temperatures have increased approximately 10 times faster than in other similar periods during the previous century or beyond. These climatic changes are pushing many organisms northwards – for example some types of plankton appear to have moved 1,100km.

Looking Ahead

However, it is not a single issue but the cumulative effect of different pressures which is most important, the briefing notes. And many of these pressures are connected. For example, higher temperatures also increase oxygen depletion, affecting marine life, while increasing CO2 levels in the atmosphere are acidifying the oceans, making it difficult for some animals to form shells. Together these changes may be disrupting whole ecosystems.

www.eea.europa.eu

Nautronix Delivers for Rowan

Nautronix delivered the first two NASDrill RS925 and NASeBOP (Emergency BOP Acoustic Control) systems from its current order of four systems for two of Rowan's new ultra-deepwater drillships, the Rowan Relentless and the Rowan Reliance. The total contract value is worth approximately $10m. Nautronix' NASDrill RS925 system has been designed to meet the requirements for a reliable, stable DP and position reference system for demanding offshore operations, in particular deepwater drilling vessels.


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Human Powered Subs

Twelve teams from universities in six countries on three continents are scheduled to meet in July 2014 to take part in the second biennial European International Submarine Races (eISR) at QinetiQ's Ocean Basin in Gosport, U.K., the biggest covered water space in Europe.

This week-long event from July 7-11, 2014, is a unique sporting and engineering challenge which tests the students' engineering skills. Every human powered submarine taking part is designed and built by each individual university, with vital amendments and adjustments and even rebuilding taking place during the week. It also tests sporting prow and stamina as the teams race against the clock with the pilot wearing SCUBA gear and pedaling underwater around a demanding slalom course in the tank measuring 122 x 61m and 5.5m deep.

Teams competing for the 2014 awards are: École Polytechnique de Montréal, École de Technologie Supérieure and University of British Columbia all from Canada; Rhine Waal University of Applied Sciences from Germany; University of Delft from the Netherlands; University of Auckland from New Zealand; University of Michigan and University of Washington from the USA; and four teams from the UK with University of Bath, University of Plymouth, University of Southampton, and University of Warwick.

"There were just six teams at our inaugural races in 2012, so it is highly rewarding to see a dozen (our top limit) registered already, with three more universities on the waiting list in case of any last minute dropouts," said Race Director, Prof William Megill, FIMarEST.

École de Technologie Supérieure (Quebec, Canada) team's submarine Omer 8 was the overall winner in 2012.

"Naturally, we want the members of our teams to have a highly enjoyable week at the races and our networking events will help them do that; but they know only too well that the overall objective of the eISR is to encourage innovative design in submarine engineering," said Megill. "Past teams, comprised of multi-disciplinary engineering students, have designed a wide variety of exciting machines, propelled either by standard rotating propellers, or by novel non-propeller thrusters.

"Regardless of the propulsion system selected, the basic design and build process boils down to five components: hull, propulsion, transmission, pilot safety and ergonomics, and control. The levels of sophistication applied to all of these components are up to each team - it is possible to do well with just a hull, some fins, and a recycled bicycle, but to really excel requires some serious thought and careful manufacturing, and of course, the submarine must be finished and functioning for that all-important week in July."

The eISR is organized by the Institute of Marine Engineering, Science and Technology in partnership with QinetiQ; and the eminent judging panel is headed by Vice Admiral Sir Robert Hill, KBE, FIMarEST.

www.subrace.eu

WaveRoller Verified by DNV GL

AW-Energy's WaveRoller received independent performance verification after operating in fully exposed ocean environment during testing campaigns in 2012 and 2013. WaveRoller device is equipped with a large array of sensor and measurement equipment that monitor the operating conditions and performance of the device. The recorded data is instantly available in the control room in Portugal, as well as by remote connection. Verification was conducted by DNV GL.

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Offshore UK North Sea

2013 sees 44% rise in North Sea fields starting production but 28% drop in exploration and appraisal drilling

The number of fields which began producing oil and gas in the UK hit its highest level for five years in 2013, as a number of operators focused on development activity. This is according to the latest report into offshore activity from Deloitte, the business advisory firm. The report, detailing activity across North West Europe over the last 12 months and compiled by Deloitte's Petroleum Services Group (PSG), found the number of UK fields which started production rose by 44% in 2013 (up from nine in 2012 to 13 in 2013). This figure represents the highest number since 2008, when 16 fields were brought on-stream.

Of the 13 fields brought on-stream last year, 84% were eligible for tax allowances, pointing to a positive industry reaction to the government incentives in place. However, a total of only 47 exploration and appraisal wells were drilled on the UK Continental Shelf (UKCS) in 2013, compared with 65 in 2012 – a decrease of 28%. During the same period, the Norwegian Continental Shelf (NCS) saw a 41% increase in drilling activity.

Graham Sadler, managing director of Deloitte's PSG, said that more needed to be done to encourage drilling on the UKCS, including incentives for exploration activity.

Sadler said: "The North Sea industry is complex and companies operating in there have to consider many factors. Despite the high oil price, margins are tight and the drop in drilling during 2013 most likely reflects the increased costs of operating. Staff costs remain high and access to equipment such as rigs, which are limited in number, drives prices upwards. "Nevertheless, we are seeing evidence that government incentives are helping to stimulate field developments - even historic discoveries - with Chevron's recent announcement that it will start work on the Alder field, which was discovered in the 1970s.

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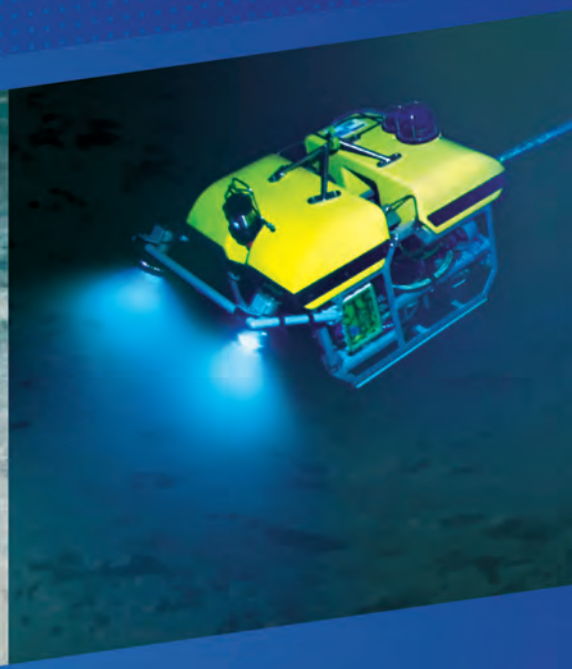

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ROV image courtesy of NOAA Okeanos Explorer Program INDEX-SATAL Rev 02/14

Bibby Offshore Invests in Fleet

Bibby engineers working on an ROV on-board one of its subsea support vessels.

Mike Arnold, Bibby Offshore's COO, Western Hemisphere.

Bibby Offshore invested nearly $45m in the past six months towards increasing its international fleet of subsea support vessels by 40%. Most recently, the company signed a contract to charter EDT Jane, a newbuild remotely operated vehicle support vessel (ROVSV).

The company now boasts a fleet of eight vessels and 15 ROVs. This dedicated ROVSV with full survey and inspection spread will be mobilized from April 2014 as part of a 180-day charter, with options to extend for an additional three years. With the continued growth of Bibby Offshore's sister company, Bibby Remote Intervention Limited (BRIL), a ROVSV was required to deliver contracted subsea commitments, as well as the increasing demand for the full suite of survey and inspection, repair and maintenance (IRM) that this class leading vessel can provide. In line with its existing work scope, BRIL will install a mixed fleet of work-class and observation class ROVs onboard the vessel, including an SMD 150hp Quasar work class ROV, SeaEye Cougar Inspection class ROV and a SeaEye Lynx Observation Inspection class ROV.

CSS Olympia

GranEnergia took delivery of the Compact Semi-Submersible (CSS) Olympia from MAC Offshore. STX Marine (STXM) and CSS Designs Ltd. developed the CSS design over the past five years. Built by Fujian Mawei Shipbuilding in Fujian Province, China, the CSS Olympia is 84.25m long with a capacity for 500 people. The primary function of the Olympia is to act as a floating accommodation unit for rig personnel. The vessel has a DP-3 rating and will remain connected to an offshore facility via a telescopic gangway system. Other features include a 12.8 ton rated helideck, and a 150MT telescopic boom crane.


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Blyth Workcat Joins Osiris Projects Survey Fleet

Image: Blyth Workcats

A new 14m catamaran was delivered to coastal survey specialists Osiris Projects by Blyth Workcats. The new boat, named Proteus of Liverpool, was custom-built at the Blyth Workcats yard on Canvey Island, U.K., to provide a fast yet stable and comfortable working platform for coastal survey work. The boat has been fitted with a range of high specification sonar and acoustic positioning systems that will provide the company's clients with high quality survey data enhanced by the stability of the new boat.

Proteus is the fifth vessel in the Osiris Projects fleet and has MCA (Maritime and Coastguard Agency) category 2 approval to work up to 60 miles offshore. With a maximum design speed of 24 knots the new boat will be able to get quickly on station and commence surveying with minimum delay. The new survey boat will work primarily for oil and gas and offshore renewable clients, performing cable and pipeline pre- and post-installation route surveys around the coastline of the U.K. and Northern Europe. The new vessel has been custom-built to include a moon pool to house a retractable sonar deployment system, a hydraulic A-frame and retractable transducer mounts and is capable of operating a full spread of survey sensors. With a spacious work cabin and sleeping for four the new boat also provides a comfortable working environment for surveyors and crew with ample space for topsides survey equipment. The boat's draft of just 1.1 meter also makes it ideal for working in the shallows encountered during precision littoral survey contracts. It is power by two Cummins QSC 8.3 500-hp engines.

Blyth Workcats Delivers for Mevagh

Blyth Workcats also built a new 11-m dive boat to the Mevagh Dive Center for use in the Western Atlantic off County Donegal, Ireland. The catamaran, to be named the Laura Dean, is scheduled for delivery in April 2014, and scheduled to begin work transporting groups of up to 12 recreational divers to dive sites in the region. The boat will be powered by two Iveco N67 420 hp engines, each driving a five-bladed propeller through a Twin Disc gearbox. These will enable the boat to achieve speeds up to 23 knots or to cruise economically at 18 knots when it is expected to consume just 45 liters of fuel per hour. This is made possible by minimizing unnecessary weight while retaining strength and by the design of what will be a turquoise-colored Blyth Workcats hull. Accommodation for passengers and crew will consist of a wheelhouse and a small saloon seating area with a toilet and galley facilities. The bright orange wheelhouse roof will extend for eight ft. over the after deck where there will be fold-down stainless steel seating along each side and bench seating in the center and racks fitted for carrying divers' air cylinders. An important feature for the dive center's customers will be a hydraulic dive lift mounted on the transom. Access will be through a transom gate leading directly onto the after deck to ensure the easy deployment and recovery of divers.

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Sonar & the USCG

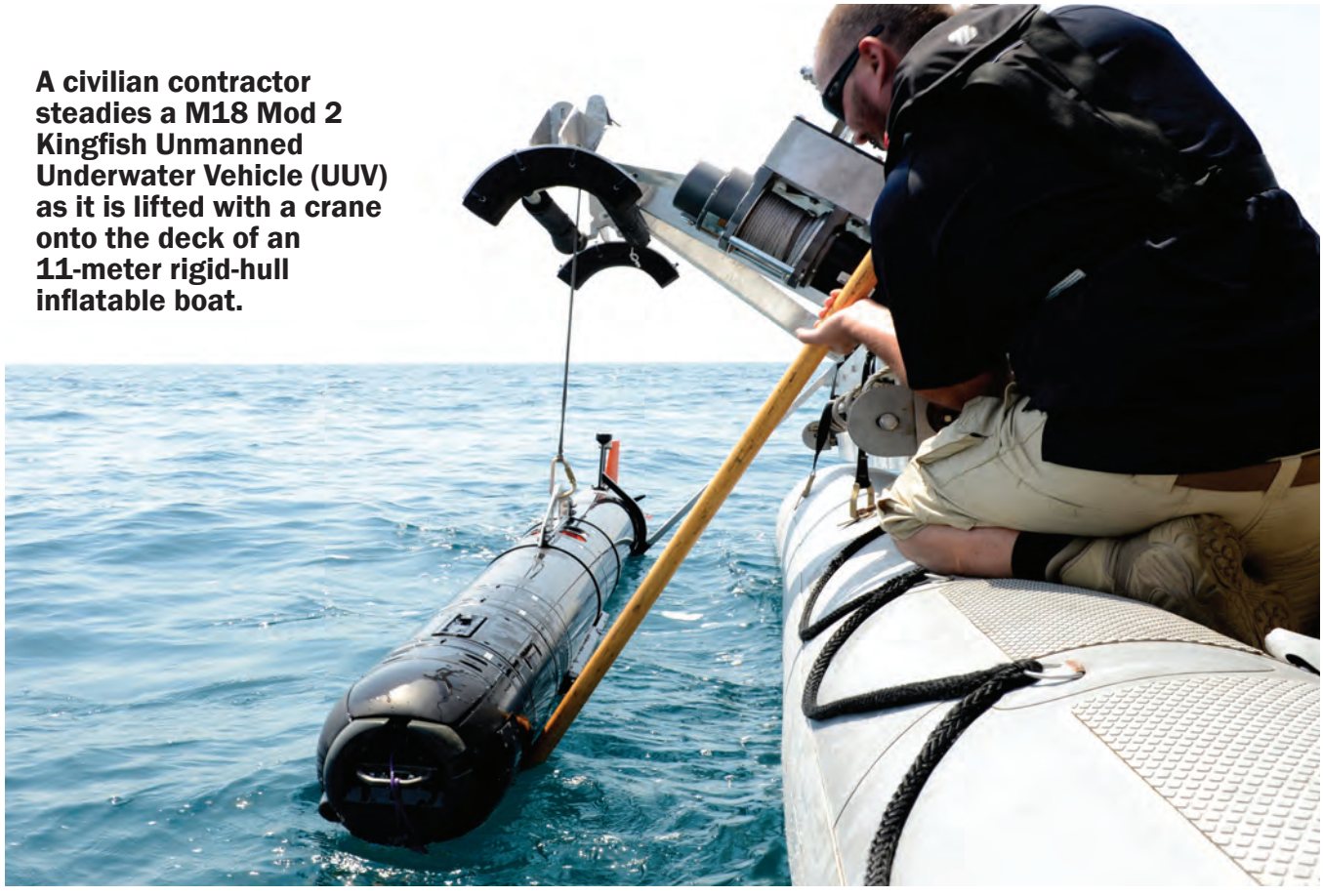
The USCG Plans to Widen its use of the subsea surveillance technology. The question is: is the investment warranted?

By Dennis Bryant

The U.S. Coast Guard is planning to widely use sonar to support its maritime security and marine environmental protection missions. The agency currently has limited capability to detect objects below the water's surface and relies on others (such as the U.S. Navy or the commercial sector) when such detection is needed.

Sonar is an acronym for Sound Navigation and Ranging. The principle is similar to radar, used in the atmosphere. While radar uses radio waves, sonar relies on sound waves, which propagate much better than radio waves do in water. There are two major types of sonar – passive and active. Passive sonar only listens, detecting sounds made by vessels, persons, fish and other things in the water, or the water itself (e.g., waves). Active sonar transmits a sound signal that then is reflected off an object within range and returns to the transducer. Measuring the time difference between transmission and reception provides an indication of the range of the target. Measuring the angle of the received signal provides an indication of the direction of the target.

Sonar transmissions are made in a variety of frequencies, depending upon the intended purpose. Low frequency transmissions have the advantage of very long range. On the other hand, these sonar transmissions can only detect very large objects and with minimal accuracy relative to range or bearing. Mid-frequency transmissions have a range measured in miles and are able to detect objects such as submarines and large whales with good accuracy relative to range and bearing. This is the type of sonar utilized almost exclusively by the military, having virtually no commercial application. High frequency and ultra-



A civilian contractor steadies a M18 Mod 2 Kingfish Unmanned Underwater Vehicle (UUV) as it is lifted with a crane onto the deck of an 11-meter rigid-hull inflatable boat.

(U.S. Navy photo by Mass Communication Specialist 2nd Class Blake Midnight/Released)

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high frequency sonar transmissions have a short range, but are able to detect small objects. This type of sonar is utilized commercially and is the type under consideration by the Coast Guard.

Sonar in the form of echo-sounders has been utilized for years by ships to determine the depth of water under the keel. A signal is transmitted straight down. The signal reflects back when it hits the seabed. The time difference provides the operator with an accurate measure of the depth. More sensitive versions are in use as fish finders. These devices differentiate between the strong signal generated by reflections off the seabed and weaker signals generated by reflections off objects in the water column. Sophisticated versions provide more detailed information, allowing determination of the size of the fish school, etc. Sonar transmitters can even be attached to trawl nets, allowing for better placement of the nets relative to the target species. Stronger and more sophisticated sonar can be used to penetrate the upper layer of the seafloor, allowing determination of characteristics such as bottom type (i.e., mud, sand, gravel) and depth to hard strata. This information can prove valuable for determination of anchorage grounds and for laying of submarine cables and pipelines.

Sonar is used commercially to examine hulls, pilings and underwater structures such as offshore platforms. This type of sonar is sometimes handheld by a diver or mounted on the end of a pole. Increasingly, it is mounted on remotely operated vehicles (ROVs) or on unmanned underwater vehicles (UUVs). ROVs have greater capabilities regarding power and data transmission, since they are tethered to a shore location or to a manned vessel. UUVs have less power and data transmission capabilities, but can get into tighter spaces and have longer potential range.

Diver detection sonar is used for detection of divers and submerged swimmer delivery systems, such as those used in several of the James Bond movies. This sonar provides detection, classification and tracking information on human underwater incursions that could endanger lives or property. It is being employed around some marine facilities worldwide, but not yet to a great extent. Limpet mine imaging sonar is used for detection of small underwater objects. Originally used for detection of limpet mines potentially attached to the hulls of ships, it can now be used to detect caches of drugs and other contraband. This type of sonar may also be used to detect hull damage and underwater structural damage.

The Coast Guard proposes to utilize commercially-available sonar equipment to broaden its capability to locate, image and classify submerged and underwater targets of interest (TOIs). This would include such things as terrorist attacks and environmental threats (i.e., pipeline leaks). This usage is aimed at protecting human safety, preventing property damage, and protecting the marine environment.

Use of the sonar by the Coast Guard is envisioned as of short duration and within a limited geographic area. For example, it might be used to protect a high-level dignitary during a visit to a waterfront facility. Alternatively, it could be used to examine an offshore facility from which oil is emanating to determine the location and extent of damage or other cause of the discharge so that it can be promptly remedied.

At least for now, the Coast Guard intends to utilize commercially-available sonar with frequencies above 50 kHz. As a result the capabilities, limitations and potential adverse effects of equipment are reasonably well-known. This, combined with the short duration and limited geographic scope of the sonar use, will serve to minimize any environmental impact. Further, the Coast Guard proposes to consult with other agencies, such as the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) prior to each planned use in all but emergency situations to determine whether there are particular environmental concerns that should be considered, such as endangered species in the vicinity. The Coast Guard also plans to utilize observers to monitor usage and identify any unexpected risks, such as boaters or swimmers approaching the area.

The sonar systems under consideration by the Coast Guard operate within the hearing range of toothed whales (150-180 kHz) and pinnipeds (75 Hz – 75 kHz). Some clupeid fish (i.e., herring, shad, sardine, menhaden) may also react to these sonar transmissions. Minor adverse impacts could also occur in the unlikely situation if a ROV or UUV were to touch down on seagrass, coral or sediment. The use of low-power HF and UHF sonar (as opposed to high-power MF military sonar) minimizes adverse environmental impact by reducing the area ensonified by the equipment.

The purpose of the Coast Guard proposal is to broaden the agency's capability to locate and classify underwater threats and other targets of interest and to more safely and effectively accomplish the Coast Guard missions. Targets of interest could include combat swimmers or divers; explosives or other offensive devices that could be delivered to underwater hulls, piers or other shore structures; and objects that have become submerged as a result of natural or man-made disaster and have the potential to interrupt maritime transportation, trade, commerce, recreational boating or other maritime activities. The use of HF (50-999 kHz) and UHF (1,000 kHz and higher) active sonar technology would provide operational commanders with enhanced ability to support maritime security, marine safety, and maritime stewardship with minimal impact on the environment. The likelihood of a terrorist attack by divers in U.S. waters is extremely low. More likely are suspicious incidents that require prompt investigation and response, similar to the various private pilots that negligently stray into restricted airspace around the White House. It is expected that the Coast Guard will more frequently use sonar to investigate suspected contraband stashes affixed to the underwater hull of incoming vessels, marine casualties, hazards to navigation, and environmental threats. Used properly, sonar can provide the Coast Guard with important new capabilities.

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Five Minutes with Hydroid President

Duane Fotheringham

Earlier this year Duane Fotheringham took over as the president of Hydroid, replacing industry icon Chris von Alt. MTR caught up with Fotheringham recently for his insights on the direction of the company on his watch.

By Greg Trauthwein

Please provide a brief personal and professional background.

My background is in engineering, graduating with a degree from Washington State University in electrical engineering. After graduation, I went in to the Navy as a submarine warfare officer and I spent about nine years in the Navy driving submarines.

When I left the Navy, I went back for my MBA (to the City University of Seattle), and after that I started with Kongsberg as a project manager. That was about 16 years ago.

(Note: Hydroid is a Kongsberg company).

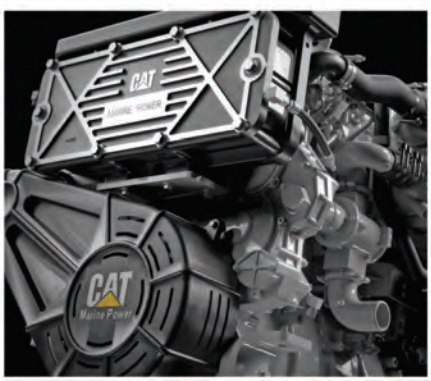
In early 2008 when Kongsberg was looking to combine with Hydroid, I was somewhat involved in that process and was given the opportunity to come out to Hydroid and join the team.

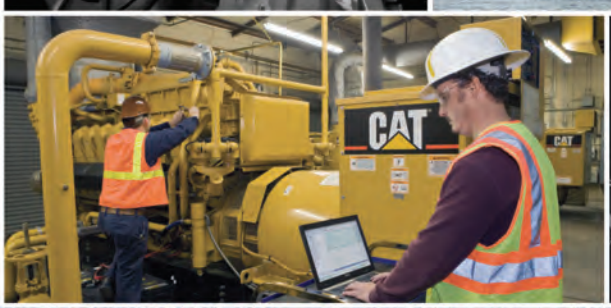
So I moved here in 2008 and took on the VP of Operations role at Hydroid. As of January 1, 2014, I took over from Chris (von Alt) as the president of Hydroid.

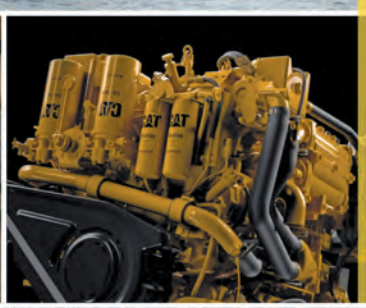
Looking back, how did you come to be interested in the subsea technology business?

I've always had a love for the ocean. I wanted to do something in that field, and that's what led me to join the Navy. It sounded exciting and interesting, and it turned out to be true. My entire career has been spent doing something in the subsea area, whether it's on submarines for the Navy or my involvement with subsea sonar, water surveil-

FULL SPEED AHEAD







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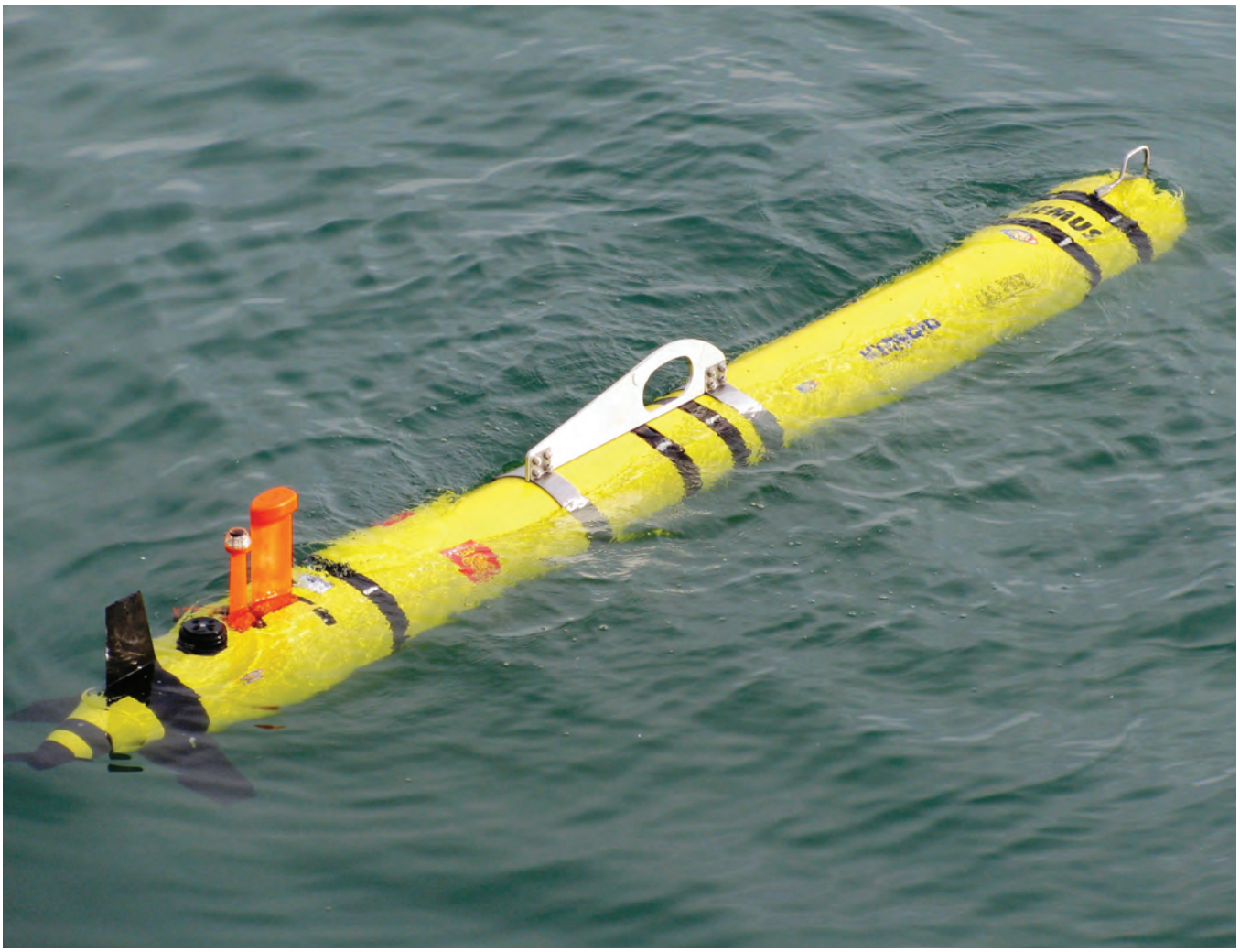
"A large part of Hydroid's success has been in the defense market, both foreign and domestic. Our strongest presence is in the U.S. Navy."



(Photo: Hydroid)

lance and diver detection at Kongsberg, to my five years to date with Hydroid.

Coming into this position, what are your immediate & short term goals?

The biggest thing that I'd like to do is continue the growth and success that we have had up to this point. Hydroid had been successful with passionate, innovative people delivering an excellent product to our customers. Over the last three years we've had 30% or better overall growth in the company, and that's revenue and in people. At the end of 2012 we were 84 people; we added 36 over the course of 2013 so we're up to 120. And we're planning to bring on 30 more over the course of this year.

What are your biggest challenges?

As we (Hydroid) grow up, we want to maintain that small company feel, that agility, innovation and passion and the connection to the product, the commitment to please the customer and build the best possible product that we can. But still, to grow and put all of the things in place that are necessary as a company gets larger, the infrastructure to support an increasing number of employees and a growing customer base. You have security requirements for dealing with the product we create. So it's putting all of those things in place that adds value to the company and doesn't detract from or change the things that got us to where we are at.

What is the greatest strength of the brand?

Part of it is the people that work here. You can't create that kind of passion unless people really feel it, believe it and really love what they are doing. The product is known for reliability, and hopefully we are known for being people that you can count on.

As we all know working in the subsea industry, when you are putting things in the water things don't always go as planned. But when they don't go as planned, you want to have a company, people that you can count on to handle the situation and make it work and be successful. Kongsberg is also a strength of our brand. We have a complimentary vehicle line with the vehicles at Kongsberg (Hugin), the vehicles of Hydroid, the REMUS line, and our sister company out in Seattle is now building the Sea Glider.

We also have sensors and integration that can bring together what we call the "Full Picture" solution. Across the company we can offer all of those pieces, and bring all of that to bear to solve a problem.

What do you consider the greatest weakness of the brand, and why?

We're at an incredible point in our history, particularly in terms of growth. The challenge is to maintain all of the things that made you good when you were smaller, and continue to do them when you are larger.

In short, describe the maturity level of the AUV market in general, as you see it.

The maturity level is increasing, which is driving our growth. You see users going from a prototype system here and there, going into user operational evaluation systems and now moving into fully operational systems. And we have contracts now that are moving into full rate production. All of those things are signs of a maturing market. The market overall is becoming more comfortable with the technology as a useful, productive tool that is becoming a key part of the 'tool box.'

Specific to the product, how is your company investing today?

We've talked about our investment in people, in talent, and that's something that we are always looking to do. In addition, we are building a new facility which is located just down the street from our present location. We are building a new 40,000 sq. ft. engineering and production facility, designed and built from the ground up to be a state-of-the-art AUV, marine robotics, engineering and production facility. That's a big investment in the company, in the technology, the future of the business and the future of the market. (Move in is planned for August 2014).

When you look at the markets (both by geography and market niche) that you serve, what do you see as the brightest prospects in the year to come?

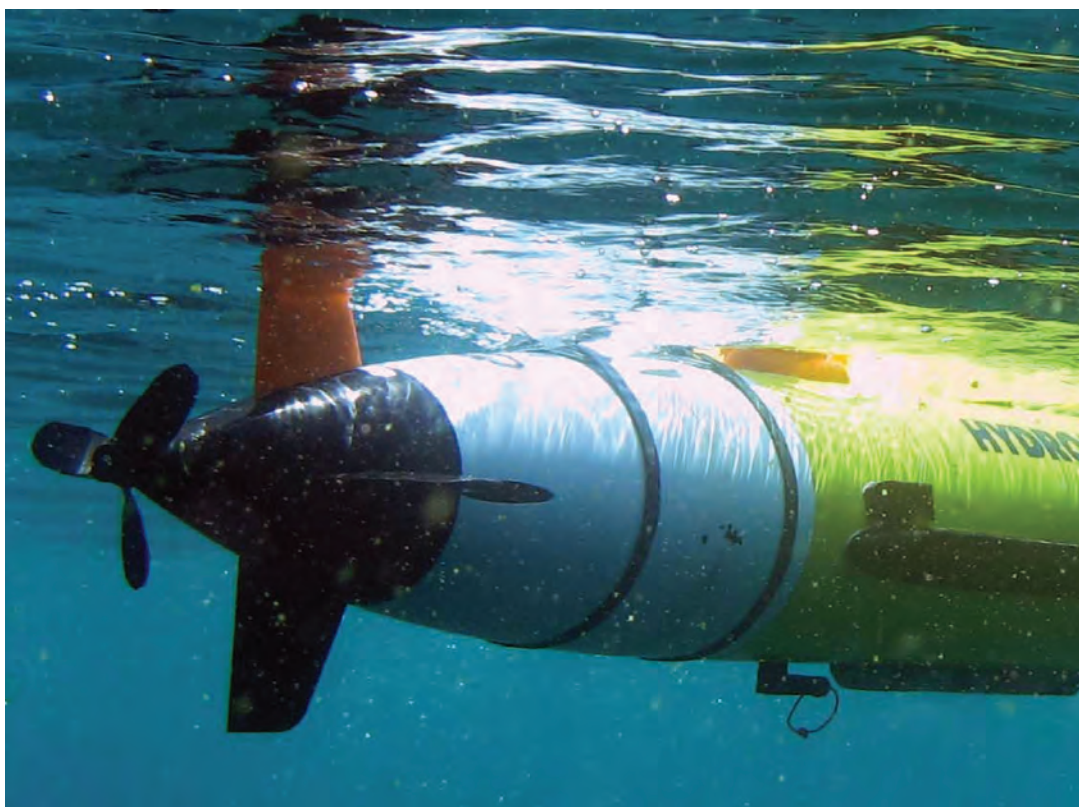
We see growth in all markets. Traditionally we've done very well in the defense market. A large part of Hydroid's success has been in the defense market, both foreign and domestic. Our strongest presence is in the U.S. Navy. The academic market is strong, and we have strong ties and roots in the market, as you know we came out of Woods Hole. That gives us a lot of synergy with that community. Across the board it is growing, both foreign and domestic.

Offshore oil and gas?

I think we see a lot of opportunity in that market. Of course our parent company with the HUGIN vehicle has been very successful in that market. We have a joint development of the MUNIN, a combination of the REMUS 600, which we are sharing that technology with our sister-company in Horten, and they are taking it and making it in the family of the HUGIN with the same operating systems, interfaces and controls but in the smaller lower-logistics platform of the REMUS 600. It's a great blending of those two technologies to come to the market with a product aimed at the oil and gas industry.

If you had to pinpoint a single

"We are building a new 40,000 sq. ft. engineering and production facility, designed and built from the ground up to be a state-of-the-art AUV, marine robotics, engineering and production facility."



(non-vehicle specific) technology that will have the greatest positive impact on AUV efficiency and performance in the coming year(s), what would that technology be and why?

I think vehicles are becoming smarter. There is more intelligence and autonomy in the vehicles. They're able to go out and do more things, more applications. If you look outside of that, one of the limitations of putting something in the water is how much energy you can put into it. The technology for energy storage and batteries, and having greater energy density and safer technologies is something that will drive efficiency and performance in the future.

What do you consider the key to attracting and retaining the people that you want?

Giving them interesting work in an environment where their ideas can be heard and put to use. Giving them the freedom and autonomy to operate, to create and bring solutions to bear.

(Photo: Hydroid)

Vehicle Technology

Advances in robotic vehicles continues to push technological limits and open new markets.

Autonomous Surface Vehicles (ASV) Ltd. launched what it is calling a revolutionary oil field services unmanned surface vehicle. ASV announced a breakthrough in unmanned oil and gas operations with the introduction of C-Worker. The multiuse offshore unmanned surface vehicle has been developed to conduct subsea positioning, surveying and environmental monitoring.

C-Worker demonstrated to members of the oil and gas and offshore surveying industries in January 2014 when ASV, alongside sister company C&C Technologies, operated the vehicle in the Solent off Portsmouth, U.K. Fitted with a Sonardyne Gyro USBL acoustic positioning system, the vehicle successfully executed seabed positioning and Compatt calibration as well as station keeping and following survey lines.

C-Worker leverages technology from more than 50 unmanned vehicles ASV has built to date. Additional technological advancements introduced in the C-Worker include the integration of a variety of offshore payload combinations including USBL, ADCP (current meter), CTD, Multibeam Sonar, Acoustic Telemetry and Passive Acoustic Sonar (PAM) for marine mammal detection. Payloads can be developed by ASV or by customers who are supplied an empty payload frame and a software and power interface specification. The C-Worker's navigation sensor suite is comprised of

ASV dubs C-Worker a breakthrough in unmanned oil and gas operations.

C-Nav DGNSS, color and light cameras, an infra-red pan tilt camera, an x-band marine radar and AIS.

Another Tiger ROV to Indonesia

Seascape Surveys of Singapore acquired its third Saab Seaeye Tiger ROV for operations in Indonesia. "The Tiger offers a good combination of size and power for jacket inspections," said Seascape's managing director, Peter Reichlmeier. He said that Tigers are used for digital inspection work of subsea jackets, platforms and other structures: "We have been using Tigers for this work for the last four years and find them reliable and versatile."

He said they will install the system on a newbuild DP2 vessel, Resolution, on long-term charter from Miclyn Express Offshore.

Seaeye Tiger ROV

Image: Saab Seaeye

The acquisition is in line with Seascape's continued growth in the Southeast Asia Region where their main operations are in Indonesia, with other areas including Thailand and Timor Leste Australia. The 1,000-m-rated Tiger has a proven pedigree in the oil and gas industry, where operators value its maneuverability inside structures and its ability to cope with strong currents. Despite its compact size, a range of sonars, cameras and tools can be added as needed to undertake a wide scope of tasks. Supplying the Tiger was Singapore-based Saab Seaeye distributor, Oceanvision.

Polish Forces Take Delivery of Teledyne Gavia AUVs

Teledyne Gavia completed a contract with the Armament Department of the Polish Ministry of Defense for the delivery of two Gavia Defense AUV systems for mine countermeasures (MCM). The provision includes all required topside equipment and AUV operation and maintenance training. Teledyne Gavia completed a competitive tender process for delivery of the first MCM AUVs into Poland, winning the contract on the basis of best value with conformance to the required functional and technical parameters. The Gavia vehicles delivered are equipped with the EdgeTech 2205 side scan sonars. The simultaneous dual frequency 600/1,600 kHz EdgeTech 2205 side scan sonar and the Kearfott T24 inertial navigation system (INS) allow the Gavia to gather high resolution, accurately navigated, sonar images while remaining submerged for several hours of continuous operation at survey speeds up to five knots. The addition of a high accuracy GPS and the augmentation of the INS by Long Base Line (LBL) beacons ensures precise navigation during even longer duration and deeper missions. This combination of sensors make it ideal for mine countermeasures (MCM) and search and salvage operations, in continental-shelf waters and beyond.

The Polish Armed Forces also purchased SeeTrack Military software from SeeByte Ltd. The SeeTrack Military MCM Evaluator software package includes all core MCM options: PMA Automatic Target Recognition; Seafloor Classification; Change Detection; and SeeByte's Performance Analysis and Training Tool. The software provides a solution for rapid on-site analysis and fusion of sensor data for the fleet of Gavia AUVs, rapidly generating targeted information from the AUV data.

The sea acceptance trials took place at the Teledyne Gavia proving grounds near Kopavogur, off the west coast of Iceland. The tests were supervised by representatives of the Polish Navy, and the results were checked by specialists from four District Military Division (Gdansk). Data analysis during

Gavia Defense AUV systems for mine countermeasures (MCM).

Photo: Teledyne Gavia

the SATs and training confirmed the vehicle performance and suitability for MCM search, location and identification missions. The vehicles were supplied through Enamor Ltd. (Gdynia, Poland), Teledyne Gavia's official representative in Poland. Enamor is a research and production company focused on new technology and active in many projects in Poland in the fields of navigation, communication, hydrography and automation.

The Gavia Defense AUV has a low-logistics, fully modular design. This facilitates rapid transport and maintenance, and is designed to increase operational availability and reliability. Each Gavia can also be equipped with a variety of additional sensor modules. This creates an asset which can be configured for MCM, search and salvage or hydrography missions, without needing to be dedicated to just one task. In the future, the AUVs delivered in Poland can be equipped with modules for multibeam bathymetry, sub-bottom profiling or even submarine emulator sonar training targets.

This contract marks the first purchase of AUVs for MCM by the Armed Forces of Poland. The knowledge gained from operating the Gavia AUVs will help develop the concept of use of AUVs in the Polish maritime theatre. Significant benefits are expected from a low-logistics AUV asset that can carry out both MCM and hydrography missions.

ROVOP Starts 2014 with Growth

ROVOP has expanded its fleet of remotely operated vehicles (ROVs) by taking delivery of four new hydraulic work class systems with a further four new ROVs expected later in the year. The company has invested $20 million in the four hydraulic Schilling HD work class ROVs, which were delivered during January, and is working to grow its offshore team by 50 to 110.

ROVOP has also invested in its own ROV simulator for its in-house Academy in order to further develop the training and competence of its offshore staff. Addressing the talent shortage in the subsea industry, the Academy seeks to build skill and competence in offshore personnel whatever their current career level.

Steven Gray, ROVOPs, MD. The company has invested $20m in the 4 hydraulic Schilling HD work class ROVs.

The $350,000 simulator enables ROV pilots to hone their skills onshore, in physics-accurate conditions.

Headquartered in Westhill, Aberdeenshire, ROVOP is an independent company which is 100% focused on providing ROVs and services to the oil and gas and offshore wind industries.

The company's latest ROVs have been manufactured by FMC Schilling Robotics and were put through their paces during acceptance testing by the ROVOP team. The ROVs are equipped with the latest Hammerhead control system, which gives pilots the ability to use an increased suite of auto functions, including automated manipulator control.

The systems are designed around the 60-minute repair philosophy, which is unique to Schilling work class ROVs, and fitted with the latest Teledyne CDL TOGS-NAV (Tiny Optical Gyro System for navigation) technology unit which combines DVL, Fiber Optic Gyro and depth sensors in one compact package to provide maximum ROV control for safe and efficient working.

Steven Gray, ROVOP's managing director, said, "ROVOP enjoyed strong business growth in 2013 and this is set to continue in 2014. In order to deliver the best in class service, we are continuing to invest in the latest and most advanced equipment on the market, staffed by the best people, to ensure we are at the forefront of technology, reliability and competence.

"Delivery of the highest quality of service is enabled by our secure internet accessible management system. The system, which has now also achieved ISO 9001 certification, ensures the business operates as robustly and effectively as possible, with considerable cost savings for both ROVOP and our clients."

Protect your unmanned investment, operate multiple systems, mix and match services Plug-and-play capabilities for unmanned systems?

There's an *App for That!*

By Edward Lundquist

Scientists have long recognized the value of unmanned systems as tools to conduct exploration and research. The advantages are many, and the cost is usually less than would be incurred for a research ship or manned aircraft mission.

Original equipment manufacturers (OEMs) who make unmanned underwater vehicles (UUVs), unmanned surface vehicles (USVs), and unmanned aerial vehicles (UAVs) usually provide the vehicle, control station, software and communication protocols, which are almost always unique to that system.

As technology and the market mature, there is a growing demand for flexibility to adapt systems for different missions, operate different systems from a common control station and upgrade them easily when new and innovative applications become available.

While the armed forces are leading the way, commercial, academic, homeland security, law enforcement and other users of unmanned systems can benefit, too.

"We've standardized the means of controlling and communicating between the ground and the bird and all of the systems involved. The standard that we're working on is called the Unmanned Aircraft Systems (UAS) Control Segment, or UCS, and it is hardware independent," said Rich Ernst, who leads the USC architecture development in DoD."

All systems do not necessarily use the same functions, but with many systems you have to accept what functions the OEM provides. Some are simple, and others complex. Some systems give you more than you really need, and some not quite enough. With UCS, you can now mix and match applications, using only what you need, and you can take advantage of new applications as they become available.

"We can identify specific requirements and create applications that meets that requirement, or closes the gap," said Ernst.

"We've been limited by the fact that OEMs have different approaches with different hardware, software, processes and interfaces—different everything," said Ernst. "That's what we're trying to avoid."

"UCS ensures that the interface standard is known to all vendors so we don't have proprietary interface standards where only the OEM can add or subtract to it without significant cost growth," said Lt. Col. James Kennedy, Product Manager Common Systems Integration with the Unmanned Aircraft Project Office, PEO Aviation at Redstone Arsenal, Alabama. "We typically end up having to go back to the same vendor who wrote the software initially to add

capability. UCS repackages that software into an open standard that is well-known, that isn't commercialized, that industry recognizes and thereby opens our competition and it opens the ability for third parties to add capability."

"Our vision is an architecture that is flexible enough to range from our small UAS and OSRVT (One System Remote Video Terminal), through our large UAS and the ground control station," said Kennedy.

According to Ernst, UCS breaks up the different ground control segment functionalities, which allows for insertion of new capabilities and upgrading of legacy capabilities—such as route planning, weather services, task monitoring or flight status monitoring that most GCS have to implement—without having to rebuild the entire GCS. "It's 'plug and play' for GCS development."

Legacy systems can be adapted for UCS, and are then able to take advantage of the many benefits of UCS. This helps to protect an investment in a system, and can prolong the service life of the system by adding new capability.

The software from the Army Bi-Directional Remote Video Transceiver (BDRVT), which is an enhanced version of the Army's One System Remote Video Transceiver (OSRVT) (made by AAI Corporation to support video and telemetry from a number of UAS such as Shadow, Predator, Pioneer and others), was used to demonstrate how UCS works.

One experiment was conducted by the Navy. "BDRVT was totally integrated software," said Wayne Perras, UCS project manager at the Office of Naval Research (ONR). "We broke it up into services and rewrote those services into UCS in two different codes. Then we combined the services back together again to see if we can have that same BDRVT to prove that that it operates vehicles."

"We showed that we've got interoperability by having it built and written in a different code, and being able to exchange or replace services while continuing to operate at the same performance," Perras said.

Then the Army flight-tested the UCS-compliant BDRVT with an AAI Corporation Shadow reconnaissance UAS.

"We took a bidirectional capability, put it into an open architecture model which was compliant with the UCS standards and demonstrated that the open model could, in fact, address the bidirectional capability that we're looking to put into our systems," said Kennedy.

The flight-test using an Army Shadow UAS was a success. "It was so successful that we have moved our whole OS-

RVT architecture to be compliant with those open standards," Kennedy said. "This allows us to more readily connect the applications that third parties may have developed, whether it's Garmin or third-party contractor developed applications that plug into our known standard, thereby reducing the cost of integration for the program overall. It also allows us to introduce competition into the program, because now we don't have to keep going back to the same vendor in order to add capabilities. We can compete and allow other vendors to be able to develop those applications—as long as they're applying those standards that are embedded due to UCS and open architecture—so the integration cost is less. So it was a very successful demo and it's caused us to really focus our OSRVT around that open architecture standard."

"Legacy GCS systems can naturally transition to using the UCS architecture. This simplifies the integration of legacy systems, since, in large part, UCS was designed from the ground up to ensure that the needs of legacy systems were analyzed and incorporated," Ernst said.

Adapting existing software incurs a cost, but that cost can have a significant return on investment.

Ernst said that there are many industry best practices for developing modular software. UCS has chosen a "functional decomposition," which breaks apart GCS capabilities based on common functions (e.g. route planning, weather monitoring, task monitoring, flight status monitoring, etc.) that most GCS have to implement.

This is benefiting the Navy today as it develops the UCS-based common control system (CCS) for the Unmanned Carrier Launched Airborne Surveillance and Strike — or UCLASS. A control station built to the UCS model could conceivably fly other Navy UAS, like Triton, Fire Scout or Scan Eagle, as well as other unmanned systems in other domains.

"It makes it easier to bring in the best of breed," said Kevin Davis, program manager requirements officer for the common control system and common standards and interoperability (OPNAV N2 / 6 F2). "If you have two apps that do relatively the same thing, we can have the warfighter determine which one they like best. If they have different, multiple weather apps or something, you could bring in those, test them out and see which one they like best and go with that one. It really helps out."

"We're not mature enough yet throughout our different systems to fly everybody's air vehicles, but that's where we're headed," said Jeff Davis, deputy program manager for CCS in the strike planning and execution systems program office at Naval Air Systems Command (NAVAIR PMA 281).

UCS is more than a technology-architecture; it's an open business model that allows small businesses to compete on an even playing field.

"It's a huge paradigm shift for us to be able to go out to multiple vendors and buy pieces and components of the system," Davis said.

"The faster that we show we can integrate those applications and get them out to users, it encourages industry to start building the better widget, and a lot of people will start getting involved in that market," said Jeff Davis.

And that's what it will become: a market. Ernst called it an "ecosystem that goes beyond the typical technical and business structure."

It's bigger than the military—other users, like the S&T community—will drive that market, too.

Ernst said that when new UCS-compliant applications are developed, they will be made available through an online "app store" repository. The best apps will be in demand, creating a market that will stimulate innovation.

"Even within the individual military services, nobody has situational awareness of what everybody's building and the opportunities for reuse," said Ernst. "There now is transparency, with a marketplace to go and look at products that can be leveraged. You might not find exactly what you want, but it helps identify products that are very close to what you want and you just go to the vendor and work with them to modify the existing product to meet your requirement."

"We talk about getting a common architecture defined for everybody. Well, here it is. That's the power of UCS architecture," said Jeff Davis. "And we've got to start thinking that way."

To learn more about the UCS architecture and how you can both adapt your system to be UCS compliant and develop applications for use across the spectrum of UCS-compliant systems, visit

www.ucsarchitecture.org

Expect the Unexpected

Acidic Oceans

By Kira Coley B.Sc. (HONS) AMIMarEST,
Scientific Applications Specialist @ Planet Ocean Ltd,

Ocean Acidification (OA) has long been accepted as an equally troublesome companion of Global Warming. Studies have not only exposed impending problems, but have given scientists an insight into the complexities behind achieving a comprehensive understanding of the overall bionetwork response to this worldwide problem. However, are investigators equipped well enough to deliver precise robust data critically needed for global ocean-atmospheric models, allowing attribution of changes to both anthropogenic and natural causes? This article discusses the considerations which need to be made while studying the impacts of OA, on both an ecological and technological level.

From the Beginning

Since the Industrial Revolution, the mean ocean surface acidity is estimated to have increased by 25-30% (1, 2), equivalent to a drop of 0.1pH, roughly 100 times faster than any change in acidity known within the last 20 million years. Predictions suggest an increase by a further 150-200%, representing an additional drop of 0.3pH, by the end of this century (2, 3, 4). Global unease as to the consequences of altering this ancient balance has seen OA become one of the fastest growing areas of research in marine sciences over the last few decades. In 2011, Andersson & Mackenzie (5) documented a Google internet search for OA as generating around 605,000 results; a replica search this week generated just under 3.2 million, demonstrating the dramatic surge of international interest from both the Public, Government and Scientific communities.

Although the specific effects of warming, acidification and changes in circulation will vary across ocean basins, it is clear that there will be multiple impacts on ocean and coastal ecosystems throughout the world(6). For aquatic ecosystems, the consequences of long-term exposure to rising carbon dioxide (CO_2) concentrations are still poorly understood (7) and while the detection of direct effects (physiological) is readily achievable, it will not necessarily shed light on the principal drivers which will be key in shaping future communities (8). Effects on individual species are likely to cascade throughout the entire ecosystem, influencing species interactions, food web dynamics, migration patterns and the overall bionetworks resiliency (6). The complications in studying ecosystem-level impacts, include yielding not only "unexpected results" but also some of the strongest ecological responses (i.e. phase-shifts) which are often unanticipated as the impact of one component (e.g. OA) on another (e.g. kelp decline), requires knowledge of a third species (e.g. kelp-competitors) or mediating factors (e.g. interactions among stressors) (8). The real problem therefore, is understanding the combined effects of additional stressors (i.e. global warming effects) which happen in line with rising acidity. Laboratory experiments can offer insight into how synergistic effects of added stressors determines alterations of marine communities in high CO_2 conditions, however, this doesn't take into account adaptations and shifts in competitive pressure, nor the natural spatial and temporal variation of pH and dissolved CO_2 in their native habitats.

The measurement of OA is historically complex and the correct determination of at least two parameters is necessary to obtain a valid description of the whole carbonate system and hence correctly interpret organism responses (9). Although dissolved CO_2 is relative to the pH and partial pressure of CO_2 (pCO_2), due to previous difficulties with pCO_2 resolution and disputes in pH measurement protocols, total alkalinity (AT) and dissolved inorganic carbon (CT) were the favoured parameters for ocean carbonate calculations (9). However, now that technology has developed allowing for more robust measurements of small-scale pCO_2 and stable pH readings, there is debate on what parameters offer the least uncertainty. This has resulted in difficulties with comparability of data, and an assortment of the four parameters being measured in various experiments (9). Therefore, not only an appreciation of ecological variables is required but also standardisations in methods for measuring OA across the scientific community.

Freshwater Systems

Acidification of freshwater was a problem that was first identified in Scandinavia during the early 1970s. Freshwater ecosystems typically have a neutral pH, but inconsistencies can occur between acidic or alkaline (10), depending on factors such as rainfall and buffering capacity. The acidity of freshwater lakes and streams is predominantly determined by the soil and rock types of an area, since 90% of the water entering these systems has passed through the ground (11). Biota within these systems can be influenced directly by changes in water quality during both short acidic episodes and longer-term sustained periods of acidification as well as indirectly, by alterations to the balance of acid-sensitive and acid-tolerant organisms at different trophic levels (12).

Although species living in environments that naturally experience significant variation in pH and/or pCO_2 may be more tolerant of anthropogenic acidification (10), the combined effects of both the chemical and biological alterations can adversely impact biogeochemical processes (12). Therefore, it's important to recognise the mechanisms which can cause both natural and anthropogenic fluctuations, and how the local topography influences the deviations.

Marine Systems

Similarly to freshwater, local topography and biological activities can cause pCO_2 and pH fluctuations in marine environments. A change in the balance between the respiratory CO_2 production and photosynthetic CO_2 consumption of marine reef organisms, can cause substantial pH gradients on a diel cycle, which may be more prominent in shallow water reefs where there is restricted exchange with the open ocean (10). As these temporary variations seem to occur regularly, it might not simply be the range over which pH varies that is important for tolerance to acidification, but also the duration.

Shallow submarine CO2 seeps are among the few sites in the world within which the ecological consequences of long-term (multi-decadal) exposure to high CO2 can be assessed in situ (7). Habitats such as those found around Castello Aragonese (a small volcanic island located in Ischia), can provide a real-time model for the future acidity levels forecasted by 2100, and consequently these acidic conditions are fatal to otherwise native species, home only to jellyfish, seagrass and algae (13).

Another unforeseen outcome is the possible adverse impacts on marine mammals' ability to communicate using low frequency noise (6). Seawater chemistry influences the absorption of sound and how sound travels underwater. With the drop in pH forecasted by the end of this century, seawaters ability to absorb sound could see it travel up to 70% farther, resulting in the potential interference of marine mammal communication by low frequency noise generated from anthropogenic causes (i.e. military sonar, shipping and seismic exploration). Research in parts of the north Atlantic has already found a decrease of 15% in low frequency sound absorption, and is thought by some to be a result of increase acidity (6).

Technology Considerations

The stressors which could influence the outcome of ecosystem-level responses to ocean acidification are abundant and varied, depending on environmental characteristics. In addition, the data is influenced by the parameters measured, therefore, it is important to perhaps overcompensate in order to achieve a comprehensive data-set which may animate additional components previously overlooked. The technology used to acquire this information will need careful consideration.

Multi-parameter integrated systems can be developed to specification, however, what is measured, where the systems will be deployed and how long for, all influence the type of technology used and in some cases, the design or calibration of the individual sensors. Long time-series data sets are vital to determine accurately what changes are taking place, especially to avoid seasonal variability which may distort data.

Considerations of climate and location attributes are also essential. Areas of low dissolved O2 (DO), nutrient rich waters, high phytoplankton abundance or tropical climates, are likely to experience elevated levels of biofouling, resulting in regular maintenance requirements or disruptions of the sensors ability to record accurate results (i.e., recording of CO2 may be from the biofouling organisms, and not a true representation of the environment and disturbed time-series). Similarly, the power supply endurance of modern instruments following extended deployments, can be disregarded if the sensor itself gets fouled within a short period. The ability to visit and recover the sensor if it is deployed without real-time telemetry will also reflect on the length of time it will need to be underwater (i.e. Polar Regions are seasonally dependent).

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Even the best technology currently available will have its limitations, whether it is resolution, long term stability and endurance or deployment depth restrictions. For example, although there are many pH monitoring solutions on the market, not all are suitable for ocean chemistry research, not just in regards to accuracy and stability, but in terms of maintenance requirements and depth limitations which reduce suitability for platforms such as AUVs, floats and gliders. Whilst technology is developing to meet these needs and overcome the current limitations, it is vital that the best available instruments should be utilized to ensure that the data acquired by them are meaningful now and in the future.

Latest Monitoring Solutions

Developed by ocean acidification researchers at MBARI and Scripps, the SeaFET Ocean pH sensor has been used extensively for ocean acidification research, coral reef research, coastal marine biology and environmental monitoring. Geoff MacIntyre of Sea-Bird Scientific explains, "There are only two instruments currently capable of measuring pH in marine waters with the accuracy and precision required to investigate the very gradual changes in seawater chemistry resulting from ocean acidification, SeaFET and SAMI-pH. The SeaFET has

SeaFET with no biofouling after long-term deployment .

The HydroC CO2 sensor.

an advantage over the SAMI-pH in that it does not use wet-chemical processes, instead it measures pH directly using an ion sensitive field effect transistor (ISFET). The main advantages of this approach are stability and resistance to fouling."

Phytoplankton abundance combined with high resolution pCO2 sensors, may help in providing long term data into natural variations in different environments. Satlantic's new series of Photosynthetically Active Radiation (PAR) sensors provide highly accurate measurements of PAR (400 – 700 nm) for a wide range of aquatic applications. PAR sensors provide superior data along with high quality construction to stand up even in the harshest conditions and application include oceanographic and freshwater productivity studies, vertical profiling, as well as laboratory photosynthetic physiology studies.

Additionally, monitoring pO2 in line with pCO2 can provide estimates in primary production and respiration of these organisms. Sea-Bird has developed an individually calibrated, high-accuracy, optical oxygen sensor to assist in critical hypoxia and ocean stoichiometric oxygen chemistry research. Used alongside Sea-Bird CTD systems, the SBE 63 optical dissolved oxygen sensor sets the oxygen measurement standard for oceanographic research.

The HydroC CO2 sensor is a unique underwater carbon dioxide sensor for in-situ and online measurements of dissolved CO2. The HydroC CO2 is perfect for profiling, AUVs and rosettes or for long-term deployment on buoys, moorings or even biogeochemical profiling floats, like the Sea-Bird Navis float, and its high-precision optical analysing NDIR system makes it ideal for air-sea gas exchange, ocean acidification, climate studies and carbon capture and storage (CCS-MMV) research. It is likely that in order to achieve certainty in data, over-compensation by measuring multiple parameters at once will not only provide insight into influencing factors at that location, but also strengthens the overall robustness of the result. There is still plenty of scope for investigating OA and the need to deliver precise data for global ocean-atmospheric models, which allow attribution of changes to both anthropogenic and natural causes. Technology is advancing to help deliver relatively simple sampling methods for CT, AT, pH and pCO2, as well as a growing understanding of the interdependencies affecting the overall bionetworks responses, on both chemical and biological levels (6).

Acknowledgements

Terry Sloane, Planet Ocean Ltd
Geoff MacIntyre, Satlantic
Dr Carol Janzen, Sea-bird Scientific
Iain Vincent, Planet Ocean Ltd
Daniel Esser, Contros Systems & Solutions GmbH

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X (Prize) Marks the Spot

By Eric Haun

Wanted: Ocean pH Sensor Technology *Reward: $2 Million*

Nonprofit organization XPRIZE creates and manages large-scale, high-profile competitions that aim to stimulate research and development solutions to grand problems across a number of scientific fields. The group has previously held competitions targeting advances in personalized medicine, automotive fuel efficiency, oil cleanup and privatized space exploration, to name a few. For its latest competition, XPRIZE has partnered with the Wendy Schmidt Foundation to launch the $2 million Wendy Schmidt Ocean Health XPRIZE to spur global innovators to develop ocean pH sensors that it says will transform understanding of ocean acidification.

According to XPRIZE, the oceans absorb about one quarter of CO2 that humans release into the atmosphere, causing changes in water chemistry and increases in ocean acidity. "Ocean acidity is a serious threat we are only beginning to understand," said ocean philanthropist Wendy Schmidt. "It could have significant ecological and societal implications, changing the health of entire ecosystems, affecting the global economy and the biodiversity of the planet."

The competition's goal is to ultimately catalyze responses to the pressing changes in ocean acidity by propelling the devel-

Quick Facts

What:	Wendy Schmidt Ocean Health XPRIZE
Prize pool:	$2m
Deadline:	June 30, 2014
Entry fee:	$1,000 per team until March 31 $2,500 from April 1
Web:	www.xprize.org

Paul Bunje, XPRIZE's, Senior Director of Oceans

opment of superior ocean pH sensor technology. "There are pH sensors available, but there are very few available options, many of which are too costly, imprecise and/or unstable to allow for sufficient knowledge on the state of ocean acidification," said Paul Bunje, XPRIZE's Senior Director of Oceans. "In particular, it has been difficult to measure pH with ease and accuracy in the coastal and deep ocean environments."

In an effort to swiftly rectify shortcomings in current sensor technology, XPRIZE is offering $2 million in incentives (two $1 million purses: one for accuracy and the other for affordability).

Over a 22-month period, leading experts in ocean chemistry and measurement will gauge entrants' ability to meet key factors including accuracy, precision and stability, as well as materials cost and ease of use. An independent judging panel will assign points throughout three competition trial phases: lab, coastal and sea. XPRIZE plans to announce the winners in Summer 2015.

Bunje said, "Through the prize, we aim to catalyze ocean acidification research, spur the development of the ocean services industry, inspire innovations in ocean sensing technology and stimulate the free market to meet the growing demand for ocean pH sensors by producing inexpensive, accurate and durable sensors that can be deployed on many platforms."

And by offering large monetary incentives, XPRIZE believes breakthroughs are near, with far-reaching environmental and market results in the short and long term.

"This device would open the door to a new market of ocean services, research and data collection on a scale that does not currently exist," Bunje said.

"If we compare this to the weather services industry for example, we are talking about a global opportunity that could develop into a billion-dollar industry. We also hope that innovative solutions will emerge that will help develop or enhance other ocean sensing technologies. XPRIZE has a lot of experience catalyzing the growth of new markets. For instance, the private space flight industry — worth more than $1.5 Billion today — did not exist before the Ansari XPRIZE."

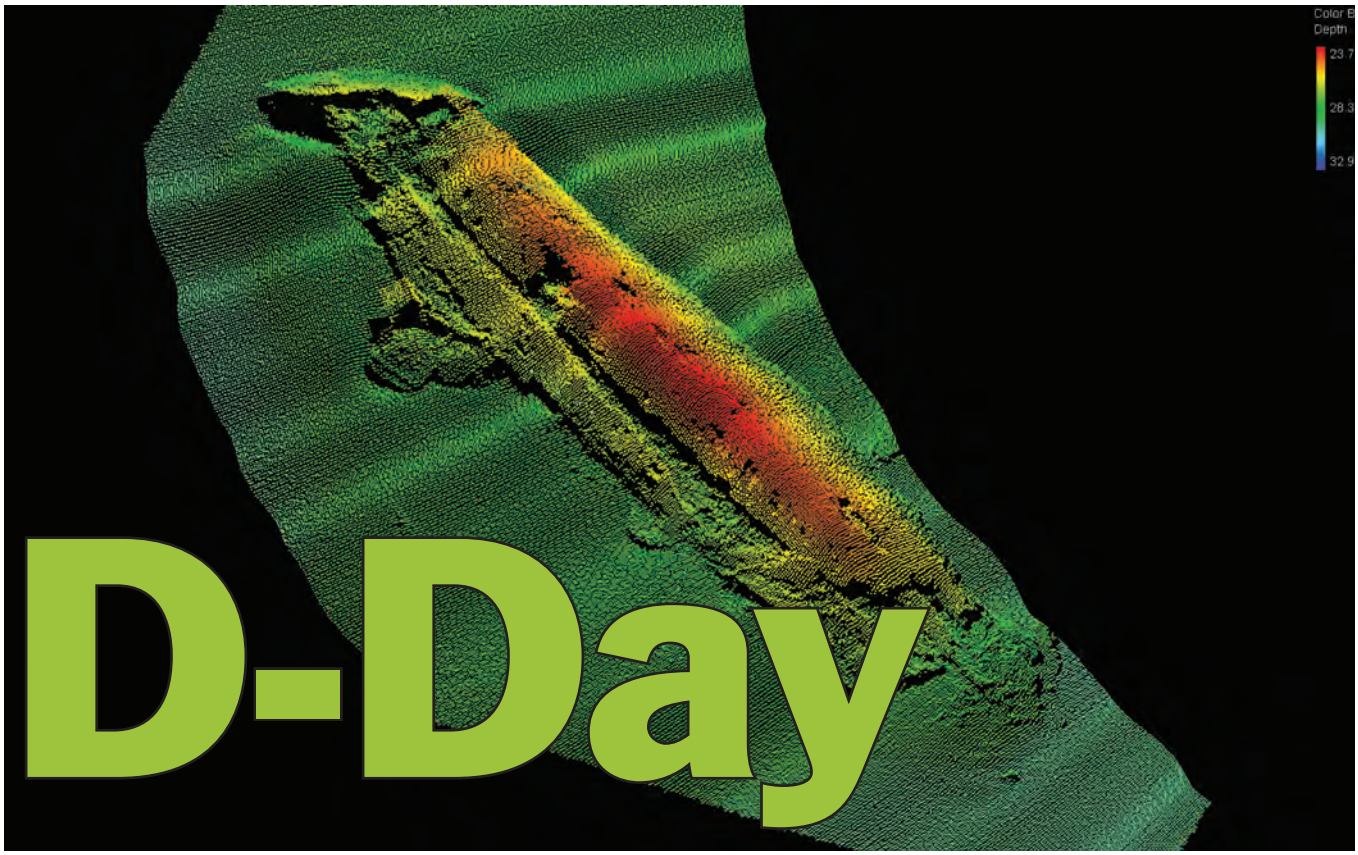
"Through the prize, we aim to catalyze ocean acidification research, spur the development of the ocean services industry, inspire innovations in ocean sensing technology and stimulate the free market to meet the growing demand for ocean pH sensors by producing inexpensive, accurate and durable sensors that can be deployed on many platforms."

Paul Bunje, XPRIZE's Senior Director of Oceans (pictured left)

Bunje added, "We see this prize as the first step in unlocking the wealth of the ocean services industry. Ever-increasing amounts of data can become valuable information, including forecasting, that could be worth billions of dollars in the future, much as weather services are today. Technology has given us extraordinary progress over the last 100 years, and we believe this prize can spur the demand for data and the wealth of information latent in our oceans. When that happens, markets win and humanity wins."

Registration for the Wendy Schmidt Ocean Health XPRIZE is open now through June 30, 2014. Entry fees are $1,000 per team until March 31, and $2,500 from April 1.

Teams are expected to come from diverse backgrounds, ranging from nanotechnology and biotechnology to industrial chemistry and marine science – from academic institutions, nonprofit organizations and small and medium enterprises – but XPRIZE said anyone with a creative idea to revolutionize ocean pH sensor technology is encouraged to compete. More information is available at xprize.org.



Mapping Mission

The wreck of the Auk-class minesweeper HMS Pylades sunk by a German midget submarine during the night of July 8, 1944 while anchored as part of the Trout defensive line (see HMS Magic above). The wreck is lying on its port side with the bow to the top. The ship's superstructure is still clearly evident to the left while the partly upturned hull forms the shallowest part of the image.

It's been almost 70 years since the invasion of Normandy, France when 156,000 Allied troops landed and began their march across Europe to defeat Hitler. And, while these soldiers' collective destinies could not have been known at the time, their will to fight was unmistakable. General Dwight D. Eisenhower called the D-Day operation a crusade in which "we will accept nothing less than full victory." The allied troops heard this charge and proved their resolve. The D-Day cost was high — more than 9,000 Allied soldiers were killed or wounded — but on Tuesday, June 6, 1944 more than 100,000 soldiers gained a crucial foothold in Normandy. (Source: D-Day - June 6, 1944 - the United States Army).

On D-Day and the days following, a 50-mile stretch of French coastline was overtaken by man and machine. In total there were 170,000 vehicles and 5,000-plus ships, including 702 war ships. The beaches of Normandy no doubt have a story to tell.

To honor those who served, a massive survey and archeological effort is underway sponsored by France Televisions, 13 other broadcasters and the Normandy region. The French Navy (Marine National) and Department of Underwater and Undersea Archeological Research (DRASSM) were involved as well. Involvement from Sherrell Ocean Services, Trimble Navigation, Ltd. and Measutronics Corporation, a Trimble authorized marine dealer, was also instrumental in making this expedition possible. Each company involved is committed to the effort and is graciously donating their time, equipment and expertise to the project. Covering approximately 500 square

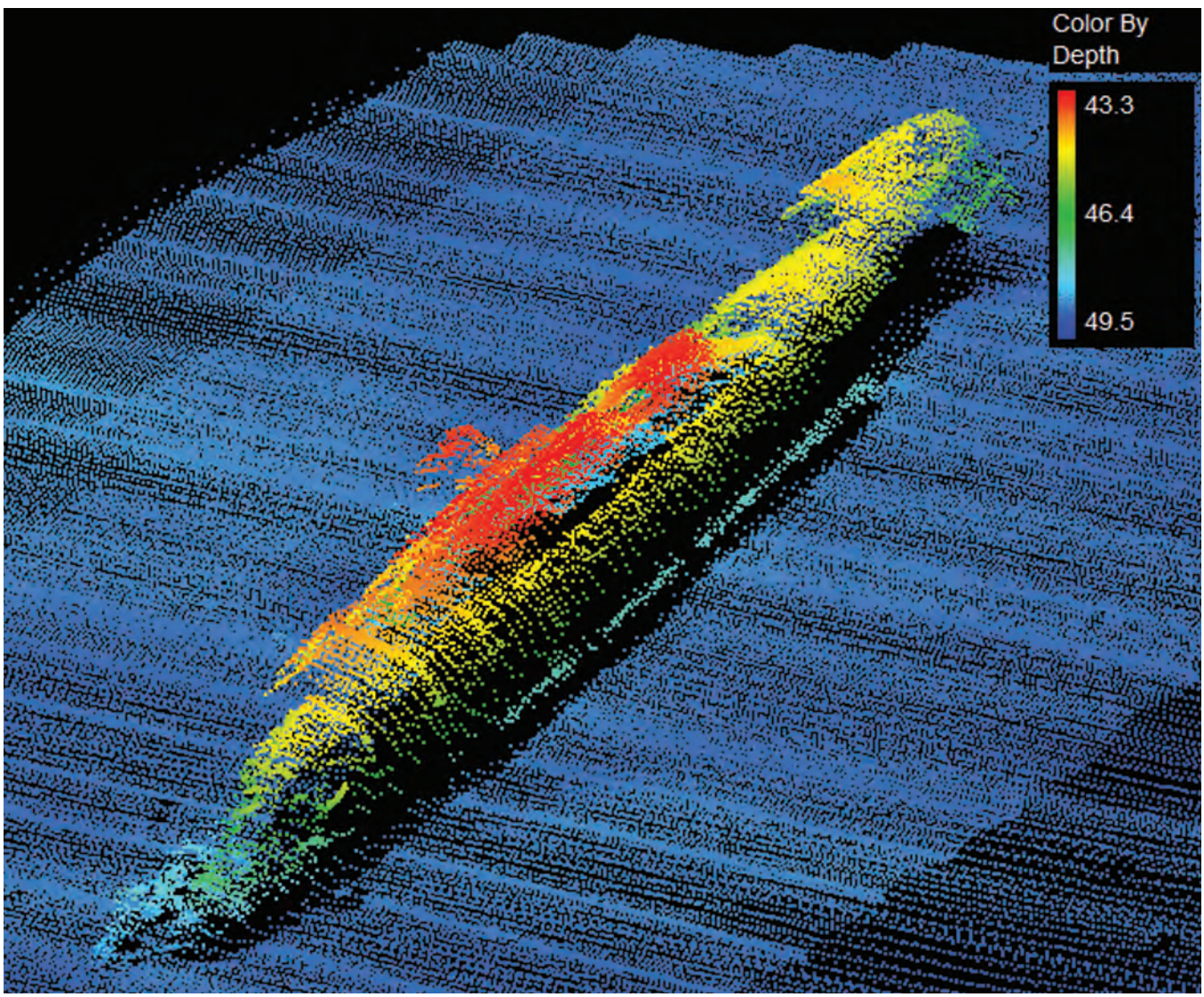
kilometers, this will be the largest continuous survey of this type ever completed in the region. Together, these groups are building a complete GIS database of the area based around the five invasion beaches of D-Day. The volunteers are sharing their professional expertise to preserve the Normandy beaches' history as well as capture 3D images of the historic assets.

Through their survey and mapping work, the team is working to have the Normandy D-Day invasion coastline designated as a UNESCO World Heritage Site by the World Heritage Committee. A UNESCO World Heritage Site is a location that is identified as having special cultural or physical significance, not to a single nation, but to the world.

Beaches of Normandy - Survey

The Discovery Phase of the mapping expedition started in July 2013 with a catamaran and crew leaving from Port of Saint-Malo, France. The total survey effort took nearly seven weeks and involved bathymetric mapping with an EdgeTech interferometric multibeam / side scan sonar combined with the Trimble SPS855/555H GNSS modular heading bundle and an inertial motion reference unit (MRU). The Trimble SPS heading bundle outputs the position, heading and timing synchronization data to the multibeam data collection and processing software. Here it is stored and time-tagged to the sonar data. Geo-referenced point cloud and side scan data are

The wreck of U390 sunk on July 5, 1944 by HMS Tavy and HMS Wanderer using the hedgehog forward firing mortar. Only one member of the U-Boat survived. U-390 was a snorkel fitted type VIIC boat and was on her third war patrol at the time of her loss. In the image the bow is to the top with the propellers and rudders clearly visible at the stern. The conning tower can just be made out to the right as is the port side ballast tank (the bulge on the central hull). Whether the damage to this is a result of the attack or subsequent corrosion is not known.



Credit: Image provided by MC4, LCL Production, and Sherrell Ocean Services, created with Measutronic's R2Sonic 2024 UHR Multibeam Sonar

displayed real time for review by the system operator as well as logged for further data editing, processing and mapping.

The Trimble SPS series heading bundle antenna array was mounted on center with the transducer mount pole near the bow of the catamaran vessel. A custom mount was developed and built to allow the entire survey sensor package to be retracted when entering or departing local ports, which have limited hull clearances, dependent upon tides. The interferometric sonar system afforded wide swath "point cloud" coverage for three-dimensional modeling and also provided side scan planimetric imagery to aid in target identification.

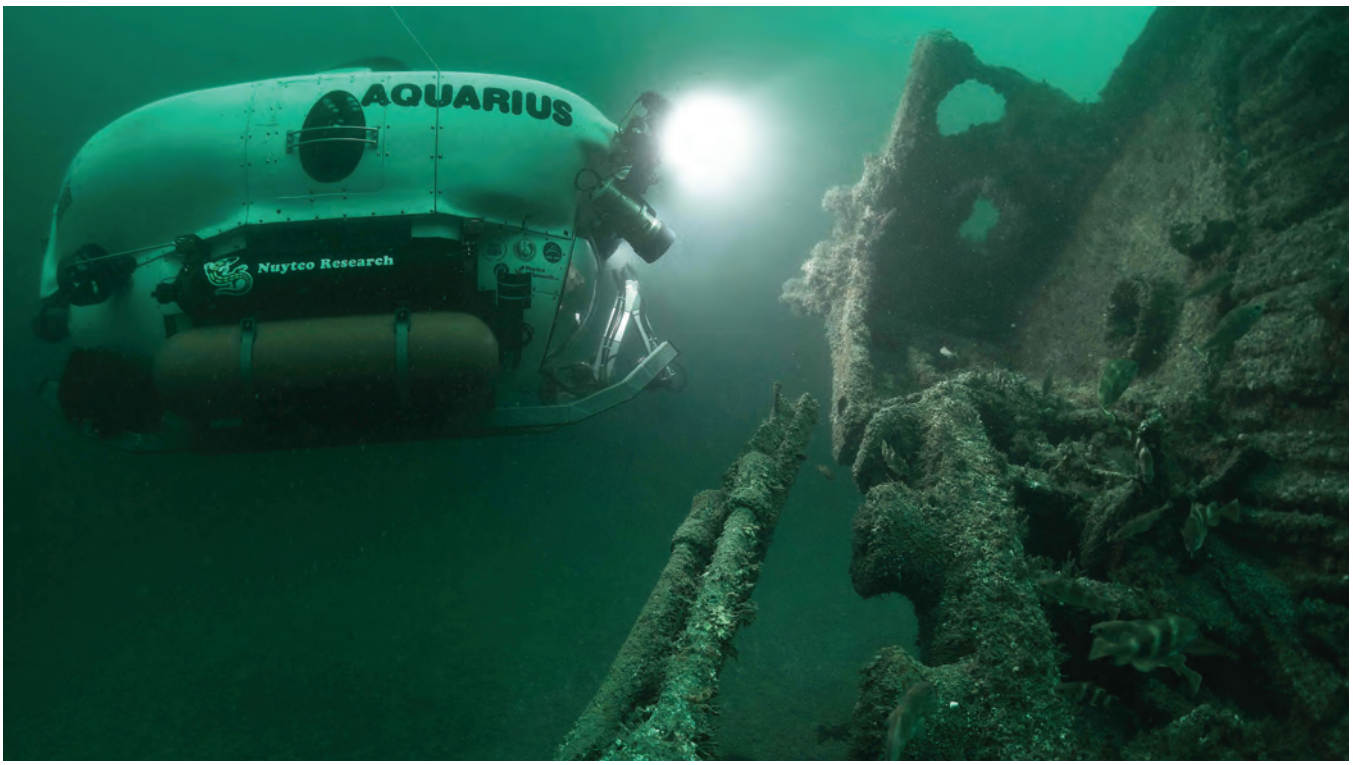
Measutronics Corporation, Trimble's leading U.S. Marine dealer, was chosen for this project because of its experience in the field of marine guidance, mapping, imaging and equipment holdings. Lou Nash, Measutronic's founder, explains that the GNSS heading bundle is critical to the bathymetric systems because, "without accurate positioning, you essentially don't have a reference point or know where you are in relation to anything else; as a result you can't accurately and efficiently trace back to targets in the water. In addition, the 'motion of the ocean' must be accounted for as all the sounding and image data collected are done so from a constantly moving platform – subject to the effects of vessel heave, pitch and roll."

The Trimble SPS855 site positioning heading bundle was selected because of its accuracy and it's interoperability with Fugro Marinestar satellite-based correction signals as well as shore-based reference stations. The SPS series heading bundle is also interoperable with a number of motion reference units (MRU). With inputs from the heading bundle receivers, the MRU provided a blended GNSS / inertial solution, compensating for the effects of heave, pitch and roll. The Marinestar correction service was chosen over land-based correction transmission stations as typical UHF radio transmission would have required increased logistics and would not have provided adequate coverage for a large portion of the offshore due to the extreme distances involved.

"We chose the Trimble receiver because it's really the only modular receiver that delivers the flexibility, accuracy and performance that we needed on a marine mapping expedition as significant as this," said Nash. "It tracks the full GNSS constellation, giving better positioning availability and high precision, plus our crew knows the equipment inside and out."

Target Identification Phase

In mid-August the crew began to focus on further development of targets of interest identified during the previous weeks of surveying. Now mobilizing from Cherbourg, France, efforts included the use of SeaBotix remotely operated vehicles (ROVs) fitted with Tritech acoustic tracking devices and sonar. These efforts were used to prioritize those targets to be further developed / examined with a higher resolution multibeam sonar system. For the remainder of the survey, crews use the SeaBotix ROVs and a video camera along while con-



Credit: MC4 and LCL Production / Copyrights Nicolas Job

MC4 and LCL Production are producing a 90-minute documentary for the international market. PBS/Nova will broadcast an adaptation in North America, both to be aired in 2014 commemorating the 70th anniversary.

Credit: Cheston VanAlstyne / Measutronics Corporation

Remotely operated vehicles fitted with acoustic tracking devices and sonar helped survey teams prioritize targets to be further examined using higher resolution multibeam sonar systems.

tinuing to collect multibeam data.

High-Interest Targets

For high resolution point cloud data collection, an R2Sonic 2024 Ultra High Resolution (UHR) mulitibeam sonar was used. With the ultra-high resolution sonar system, the crew collected high-resolution point cloud data for about 20 historic assets of particular interest.

As a further effort in providing the most accurate point cloud data possible, GNSS phase data and inertial data were collected and logged with an Applanix POS MV motion reference unit. Data were then post processed with Applanix's POSPac MMS software providing a "true heave" blended GNSS / inertial solution. The post processed data files were then read into a hydrographic survey software package. Martin de Kievit, business development manager for Trimble Marine in the Heavy Civil Construction division, explains that the survey software grabs input from the GNSS receiver where it allows for display and editing of track lines, sounding profiles and text data. The software system correlates time-tagged tide, vessel position, motion and sound velocity correction data which are used to accurately plot and record locations.

"Our surveys reported some 300 targets [artifacts] and about 20 'new' wreckage sites were more fully developed," said Nash.

As submerged targets of interest were more fully developed and accurately located, crews also launched small manned submarines to capture film footage of various high-profile wreckage sites. Led by Andy Sherrell of Sherrell Ocean Services, the crew filmed sites in order to capture color and details of what the servicemen may have faced on that fateful June day. Using video, sonar, 3D imagery and 3D visualizations, the crew is essentially "peeling back the water to bring these stories to life," Nash added.

With higher resolution images and precise point cloud data, the crew is hoping to determine the actual ship, aircraft or vehicle name of the artifacts revealed. With this information, historians will also endeavor to derive names, ranks and associations of the crewmembers that were aboard the vessels or vehicles when they were sunk and destroyed.

Updating the GIS Database

During the months to come, teams will continue to work with the massive 11TB data set. The United Kingdom Hydrographic Office (UKHO) and the French nautical charting authority (SHOM) are collaborating in an effort to update the international wreck database for the area. Because a large percentage of these identified artifacts are newly discovered or were inaccurately positioned previously, the team is working to make these corrections before they deliver the complete survey data to the UNESCO World Heritage Committee for review. To commemorate the event, MC4 and LCL Production are producing a 90-minute documentary for the international market. PBS/Nova will broadcast an adaptation in North America, both to be aired memorializing the 70th anniversary.

Honoring Those Who Were There on "The Longest Day"

During the official 70th Anniversary D-Day ceremony scheduled for June 2014, veterans, dignitaries and archeologists will meet along this historic coast to honor those who have served and sacrificed. Led by the French Department of Underwater Archeological Research, manned submarines will also escort a handful of WWII veterans and historians underwater to investigate a few of the high-profile identified wrecks.

"Nearly everyone we approached about providing support for this historic mapping expedition, by means of donating equipment or personnel, was extremely supportive and enthusiastic about the project," said Nash. "Everyone has considered it an honor to be involved in this effort, and I know I feel that way, as do our guys."

3D Imagining

Real-time with Synthetic Aperture Sonar

By Jeremy Dillon, PhD

Synthetic Aperture Sonar (SAS) is a technique for creating high resolution seabed imagery that shares many similarities with Synthetic Aperture Radar (SAR). The forward motion of the sonar is used to synthesize an array that is much longer than its physical length by combining multiple pings in software. SAS uses signal processing to circumvent the usual trade-off between range and resolution in conventional sonar. Although military applications such as naval mine countermeasures have been the major driver of development, SAS is truly a dual-use technology with great potential for offshore oil and gas surveying, underwater archaeology, benthic habitat mapping and deep sea mining.

In Figure 1 (below), an example SAS image is shown from a sea trial conducted by the U.S. Naval Undersea Warfare Center (NUWC), which illustrates the constant 3x3 cm resolution to 220 m range in water depth of only 27 m.

In addition to reflectivity images, SAS can produce highly detailed topographic maps of the seafloor by detecting the angle of arrival of seabed echoes coming from a given range bin. In a configuration known as Interferometric SAS (InSAS), two vertically separated arrays produce bathymetric maps that are exactly co-registered with the corresponding SAS images. This combination of synthetic aperture processing and interferometry solves the problems of limited resolution and coverage rates encountered with conventional swath bathymetric sonars and multibeam echo sounders. When the InSAS bathymetric resolution approaches that of the corresponding SAS image, it becomes possible to overlay the reflectivity and topography to create a true 3D picture of objects on the seabed. The ability to generate centimeter-scale resolution in all three

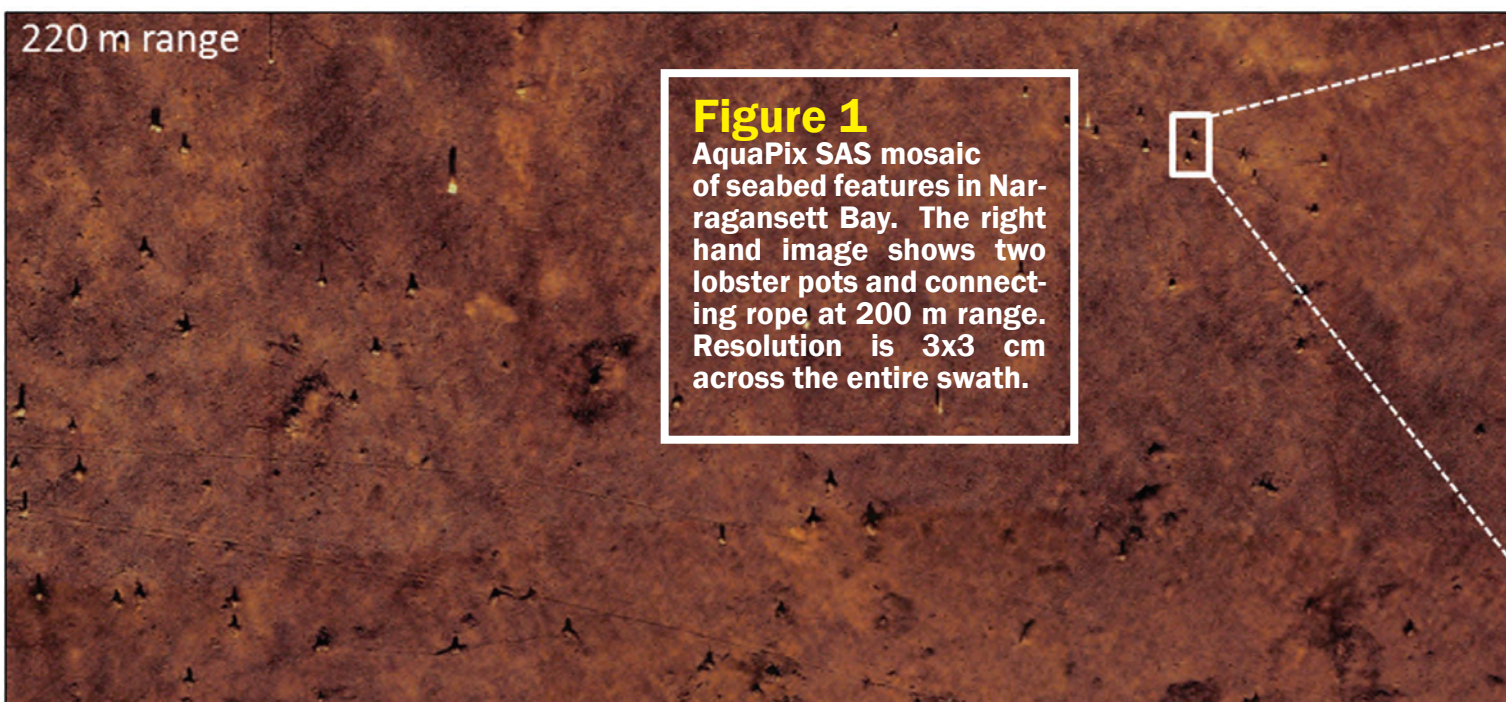
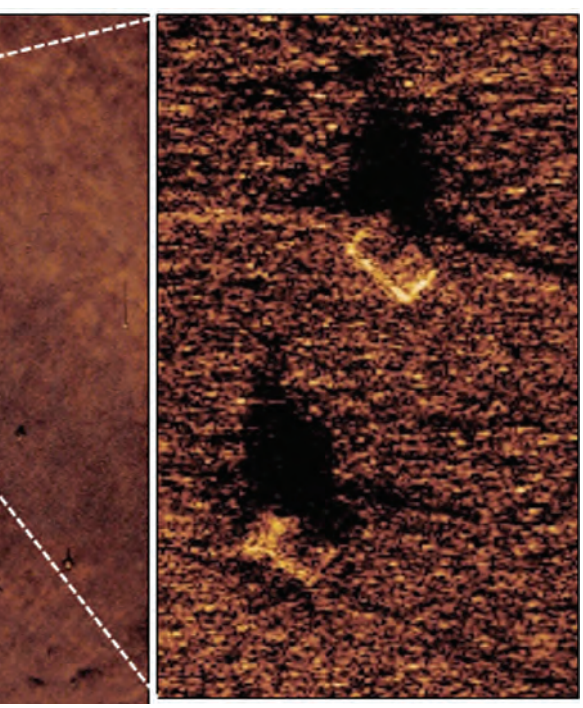


Figure 1
AquaPix SAS mosaic of seabed features in Narragansett Bay. The right hand image shows two lobster pots and connecting rope at 200 m range. Resolution is 3x3 cm across the entire swath.

dimensions has the potential to provide significant improvements in the detection, classification and identification of small seabed objects. For example, Kraken's INSIGHT software produces co-registered bathymetric maps with horizontal resolution as low as 5x5 cm. AquaPix data from an InSAS bathymetric survey conducted by Australia's Defense Science and Technology Organisation (DSTO) is shown in Figure 2, which illustrates the enhanced level of detail compared to a conventional hydrographic survey.

Over the past decade, Autonomous Underwater Vehicles (AUVs) have evolved from technology demonstrators to commercial products that are routinely used for operational survey work. AUVs offer many advantages compared to towed or ship-mounted systems, such as ease of deployment, reduced need for human intervention and lower operating cost. A further advantage for military operations is the ability to forward-deploy an unmanned system into potentially hostile waters. An AUV solution is particularly attractive for minehunting compared to the conventional approach of towing a sensor through a minefield using a manned surface vessel. However, one challenging aspect of untethered operation is the greatly reduced communication bandwidth between the vehicle and the operator. The volume of data collected during survey missions is typically too large to be transferred through an acoustic communication system while the vehicle is submerged. Removable storage modules allow data to be rapidly downloaded when the vehicle is recovered to swap batteries. However, a bottleneck remains as many hours of data needs to be processed at once.

Compared to Remotely Operated Vehicles (ROVs), AUVs have seen much



more emphasis on onboard processing and intelligent algorithms for path planning and environmental adaptation. Until recently, AUV real-time InSAS processing has been limited by the available onboard processing power to form synthetic aperture imagery and to generate the corresponding high resolution bathymetry. However, with advances in parallel computing technology and fast algorithms for image processing, it is now practical to perform 3D imaging in real-time using low cost, off-the-shelf Graphics Processing Unit (GPU) technology.

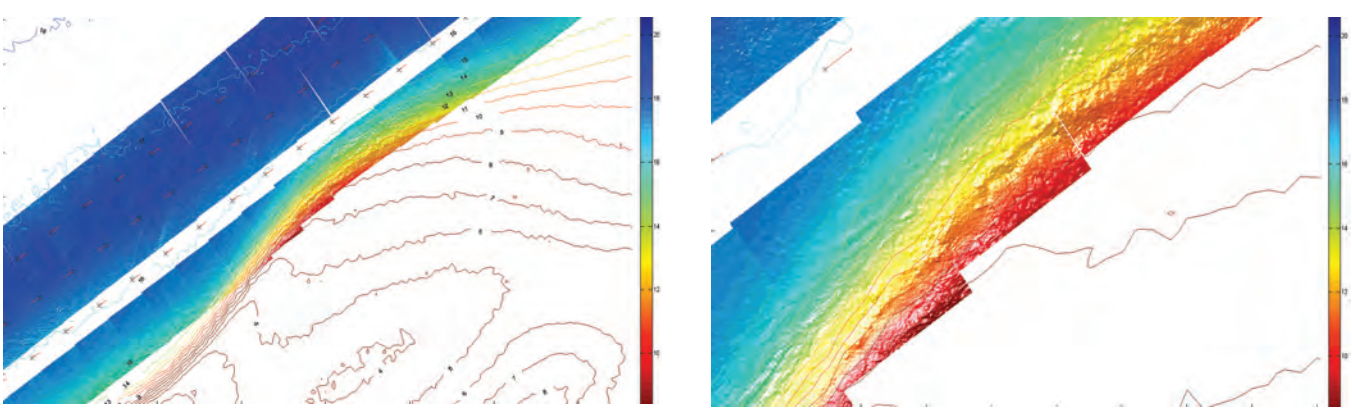
One of the advantages of parallel computing is that it is inherently scalable, allowing a seamless trade-off between power consumption and processing speed. Real-time onboard processing ensures that the data downloaded from the AUV is ready for immediate analysis. A further advantage for autonomous systems is that target detection and tracking algorithms can be embedded into the vehicle control system to revisit targets of interest or to adaptively update the mission plan based on survey metrics such as continuity of coverage or image quality. Kraken's real-time AUV processor performs InSAS 3D imaging twice as fast as raw data are recorded, leaving significant computational resources available for applications such as Automatic Target Recognition (ATR), pipeline tracking, and autonomy.

The effectiveness of target classification is improved when high resolution sonar imagery is acquired from multiple viewing angles. As targets become more stealthy, it is desirable to extract as much information as possible from the reflected acoustic waves to minimize the residual risk of misclassification. When a target is imaged with an InSAS, an extremely detailed 3D image can be formed by combining the imagery and bathymetry from multiple views. Recent experimental work with Defence Research and Development Canada has shown promising results using this technique. InSAS images and bathymetry from multiple views of a Mine-Like Object (MLO) were coregistered in a common coordinate system. In geographic coordinates, the orientation of each acoustic shadow varies while the target features remain fixed. The views were summed to produce a multi-aspect 3D image of the MLO without any acoustic shadows. Several structural elements such as lifting lugs were much more visible in the multi-aspect image than in the individual SAS images.

Survey operations typically consist of pre-mission planning, deployment and recovery of the vehicle and sensor package, and post-mission processing and analysis of the data that have been collected. Post-mission processing often includes quality control, filtering, geo-referencing, correcting for environmental conditions and creating mosaics of imagery and bathymetric contour surfaces for integration into a Geographic Information System (GIS). While real-time InSAS processing is a significant improvement over post-processing raw sonar measurements, it is clear that the overall work flow can be further improved by migrating post-mission tasks to an onboard processor.

Kraken has connected with the software company CARIS to develop such a capability for InSAS with many of the traditional post-mission tasks being executed automatically during the mission itself. In addition to reducing the demands on human analysts, onboard processing can also shorten the decision time for acting on the information gathered during a survey. For example, in amphibious warfare involving a mine threat, it is highly desirable to minimize the time required before troops can be safely landed. The integration of real-time InSAS processing with GIS software is a promising approach for increasing the overall tempo or seabed survey operations. As technology evolves, it is anticipated that traditional survey deliverables consisting of series of images and soundings will be supplanted by GIS databases containing 3D imagery with attributes describing detected targets of interest. Kraken are CARIS are working together to allow InSAS data to flow into

Figure 2 AquaPix InSAS mosaic and zoom of seabed topography in Jervis Bay with 25x25 cm horizontal resolution. Images courtesy of DSTO.



CARIS Bathy DataBASE technology, reducing the time taken to generate modern survey deliverables.

Ideally, the tools for seabed mapping would be ubiquitous and persistent, with data being collected continuously at a sufficiently high resolution to meet the needs of all end users. The key to realizing this vision is lowering the cost of both platforms and sensors to not only reduce the initial investment required, but also to minimize the financial risk in the event of loss. Large diameter vehicles have been ideal development platforms due to their size (for ease of mechanical integration) as well stability. However, the cost and requirements for launch and recovery can be prohibitive.

A recent development at Kraken has been the design of a compact InSAS array, known as MINSAS (for Miniature Interferometric Synthetic Aperture Sonar), that is optimized for smaller diameter low cost platforms such as small AUVs and towed bodies. While there will always be a need for a range of vehicle sizes, the benefits of InSAS technology are now available across a wide spectrum of platforms. Future work will continue to push the limits for surveying with smaller and more affordable platforms, thereby bringing real-time 3D imaging to widest possible group of end users.

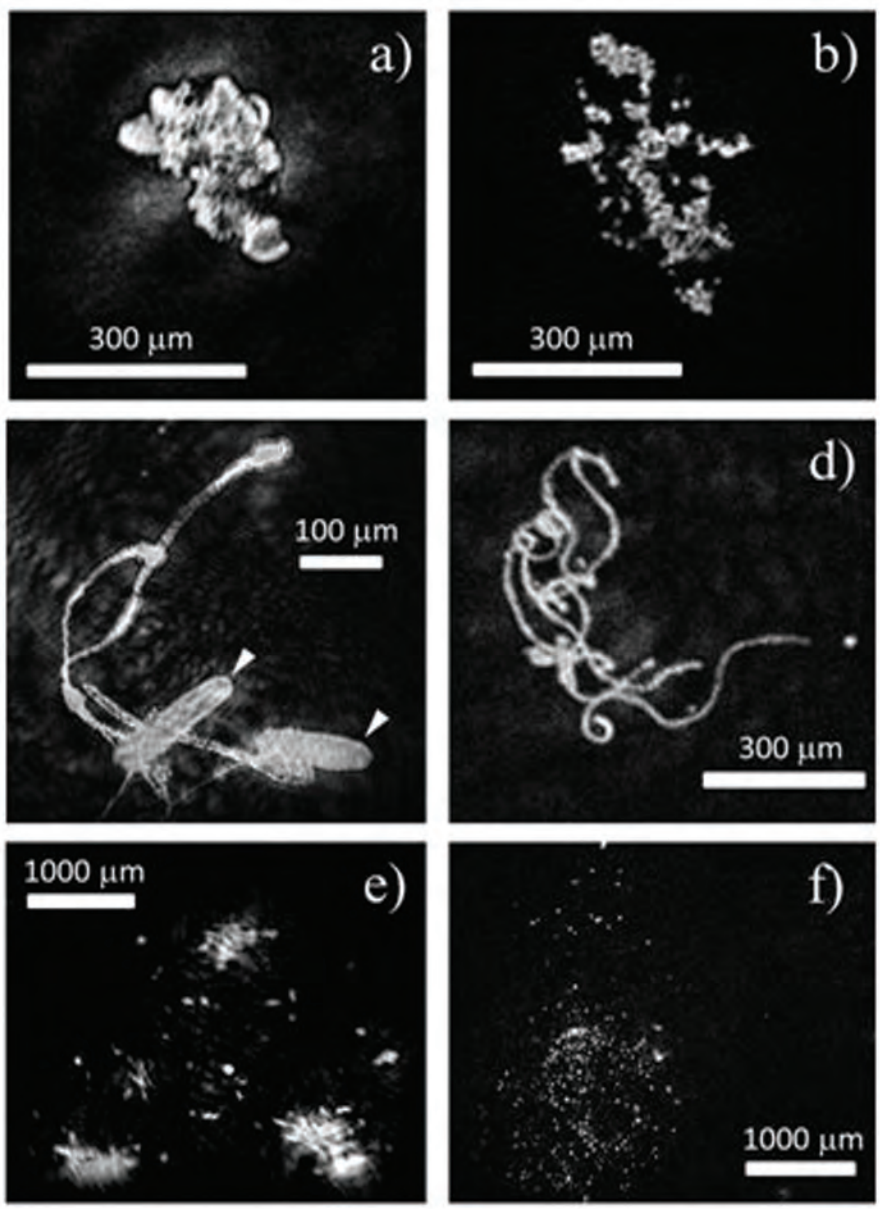
Jeremy Dillon holds a PhD in physics and physical oceanography from Memorial University of Newfoundland, as well as master's degrees in mathematics and aeronautics from Carleton University and Caltech, respectively. Previously, he was an instrumentation engineer with the Flight Research Laboratory of the National Research Council Canada specializing in inertial/GPS navigation and distributed real-time systems. His present interests include synthetic aperture sonar, underwater navigation, and repeat-pass interferometry.

Via Resolution Optics

"I can see clearly now ..."

By Tom Peters

From 6000m



A small and relatively new, Halifax-based optics company is optimistic its submersible microscope will soon be getting a closer look as an instrument suited to a variety of applications.

Resolution Optics, incorporated in 2009, has developed the submersible microscope that can be used down to a depth of 6,000m.

"The company came out of the physics department at Dalhousie University (Halifax) and its two founders, Dr. Manfred Jericho and Dr. Juergen Kreuzer are both world renowned experts in the field of holographic microscopy," said Dr. Stephen Jones, CEO.

Dr. Kreuzer developed the algorithm that allows for fast and accurate reconstruction of holographic images captured by digital inline holographic microscopy instruments.

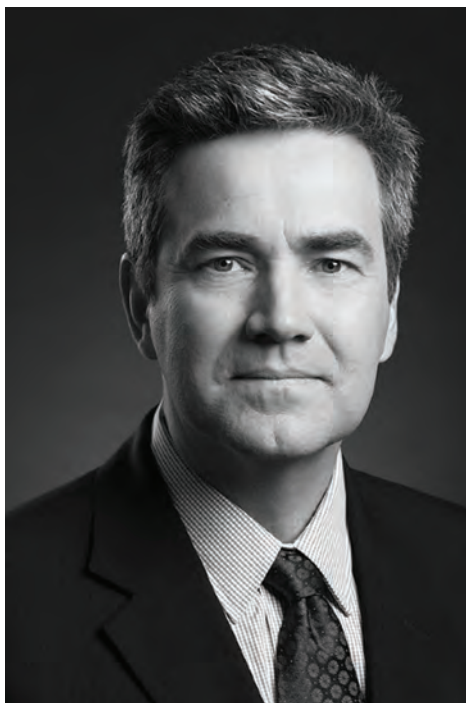
Dr. Jericho co-owns the patent for the holographic reconstruction algorithm.

Backed by 20 years of experience in research and technology, the two scientists developed their microscopes which initially were sold as desk top models to academic researchers.

But there was the realization there was a greater market.

"Because the technology and the hardware are so simple and there is such a wide variety of applications, we made the conversion from a desk top microscope to a submersible microscope and once we did that, the potential uses on a large scale are numerous," said Jones.

The company spokesman said the hardware in the submersible microscope



"Because the technology and the hardware are so simple and there is such a wide variety of applications, we made the conversion from a desk top microscope to a submersible microscope, and once we did that, the potential uses on a large scale are numerous"

Dr. Stephen Jones, CEO
Resolution Optics

is "very simple and is a bit different than the conventional microscope."

He explained a conventional microscope has a very narrow depth of view "so if something is moving quickly it will come in and out of focus and if you are looking at it you manually have to adjust your focus to try and capture it. Odds are you won't be able to track it in focus. And also most samples have to be stained or fixed or somehow manipulated to show up."

The Resolution Optics' microscope surprisingly operates without a lens.

"Instead, light from a blue-violet laser is focused on a tiny pinhole (500nm) and a spherical cone of light is transmitted through the sample. Part of the light wave is scattered by objects present within the volume and both unscattered and scattered waves reach a digital camera sensor, producing an interference pattern. This interference pattern image is known as a hologram and is recorded by the camera sensor. That is the easy part," he said.

"The second step of the process is to reconstruct the hologram to generate an image. Extremely sophisticated software is used to process the hologram and it digitally reconstructs the shapes and positions of objects within the volume, as they were when the hologram was recorded," he said.

"Basically, it is possible to 'digitally refocus' images after they were captured. This enables researches to study the whole volume or depth of field, in comparison to conventional microscopes that generate very narrow two-dimensional images," Jones said.

Speed is on Resolution Optics' side.

"We can digitally reconstruct at 17 frames per second so we can market ourselves as a real time NC2 imaging. We are the only company that can do that," Jones claims. "Anybody else trying to use holography for imaging is at least a 1000 times slower."

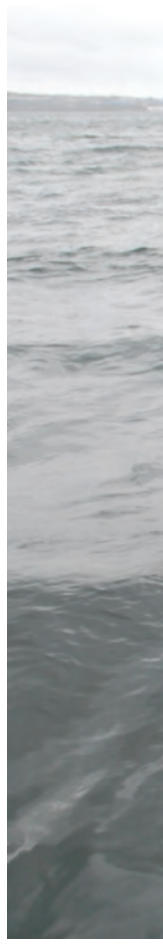
Jones said Jericho and Kreuzer refined and perfected the process.

"The concept of a light source, pin hole and camera all in a line with one another, that's the basis for the technology called digital inline holography," he said, citing other holographic systems have multi-light sources.

"Then you have mirrors and beams are split and those microscopes get very complicated and very expensive. The fact we can make our microscopes so small is because basically we only

Below: The microscopes are unique in the sense that they don't use any lenses.

Right: Bedford Basin deployment, right



need the three elements: light, pinhole and camera," he said.

But again he stressed that "the speed at which we do the second step of the process is really to our advantage."

The first use of the submersible microscope was water profiling in marine oceanographic research done in partnership with Old Dominion University in Norfolk. The microscope was dropped to a depth of 6,000m in the Caribbean which produced "the first images of micro-organisms at that depth and that degree of resolution," said Jones.

The equipment's ability to withstand extremes was tested when it was later used in a project in the Canadian Arctic under the ice with McGill University of Montreal, to image Arctic springs to see if there was life in those springs.

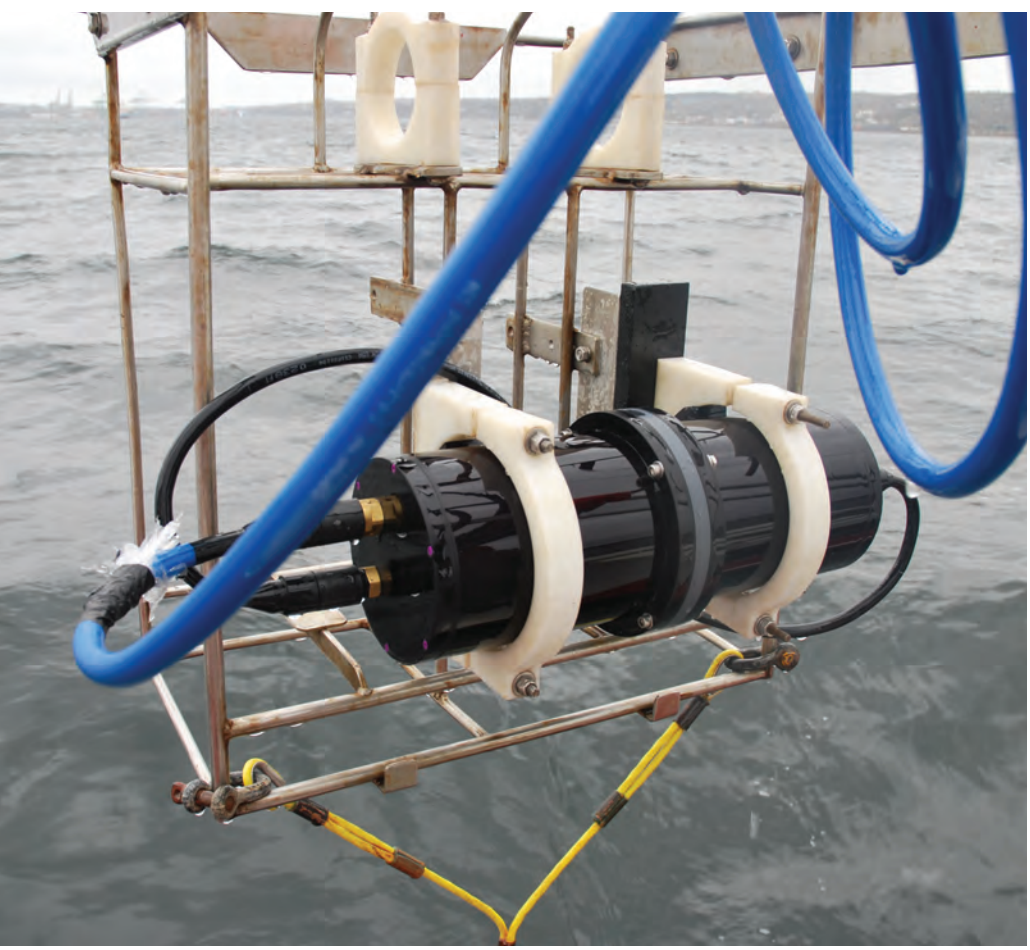
"We imaged quite a lot of bacteria and life forms in that [project]," Jones said.

A large area of interest for Resolution Optics is the oil and gas industry where the company feels it is well suited to image and quantify oil.

"Our device does much more than imaging, it is also a particle counter. It counts sizes and does population counts in real time in an instagram format. There are not a lot of imaging counters on the market. Most of them are light scattering counters that are indiscriminate. If you put one in a body of water it will count everything in that water. What we do in oil is oil drops are perfectly round and have a spherical algorithm. We only count round objects and get rid of everything else. Our oil counts are more accurate than anything that is out there," said Jones.

The ability to do these oil counts is beneficial to research groups that are trying to determine the effect of chemical dispersants on oil.

Jones said the information the submersible microscope can provide could



be used in cleaning up oils spills.

"Our microscope can be deployed at any depth, and the majority of oil is under water so that is where we would like to go," he said.

Another major application for the submersible microscope is identifying harmful algae blooms.

"That's basically deploying the microscope and using the image feed for water monitoring. Early detection for harmful algae could be done in municipal water systems, lakes and rivers or offshore but basically in any body of water where you would normally take a water sample," Jones said.

There is still a manual aspect to identify what is in the data collected but Jones said Resolution Optics is about half way through developing "a software recognition program where harmful algae species are identified automatically based on the morphology or how they look."

He said the ultimate goal is to have a worldwide base of researchers contributing to an image library because some algae species in different parts of the world look different.

Jones said the company is looking at applications in aquaculture to monitor for harmful organisms or sea lice and also to count fish food particles to determine how much is getting consumed and how is getting wasted. And also in the shipping industry to monitor oil in bilge and ballast water that may transport harmful organisms from port-to-port.

"We can put a small microscope in a ballast tank and have water flow through the device and create a software report 72 hours before the ship comes into port with the idea being that by time ship gets to port they know the condition of their ballast and can provide information," he said.

Jones also sees future potential for the submersible microscope in the development and production of algae bio-fuel. He said Resolution Optics could participate "by virtue of how we do our images. We are capable of distinguishing algae at various points of its lifecycle and when algae cycles are at their maximum and loaded with lipids. We can create a customized software to tell us the optimum time to get maximum yield from algae which currently is done bio-chemically."

The logical step for the company at this point is to partner with bio-fuel company, said Jones, "to give us the opportunity to go an image and verify that what we are capable of doing matches what they are doing bio-chemically."

Jones said the company's main markets for its submersible microscope are Asia Pacific countries, especially for use in the area of water monitoring.

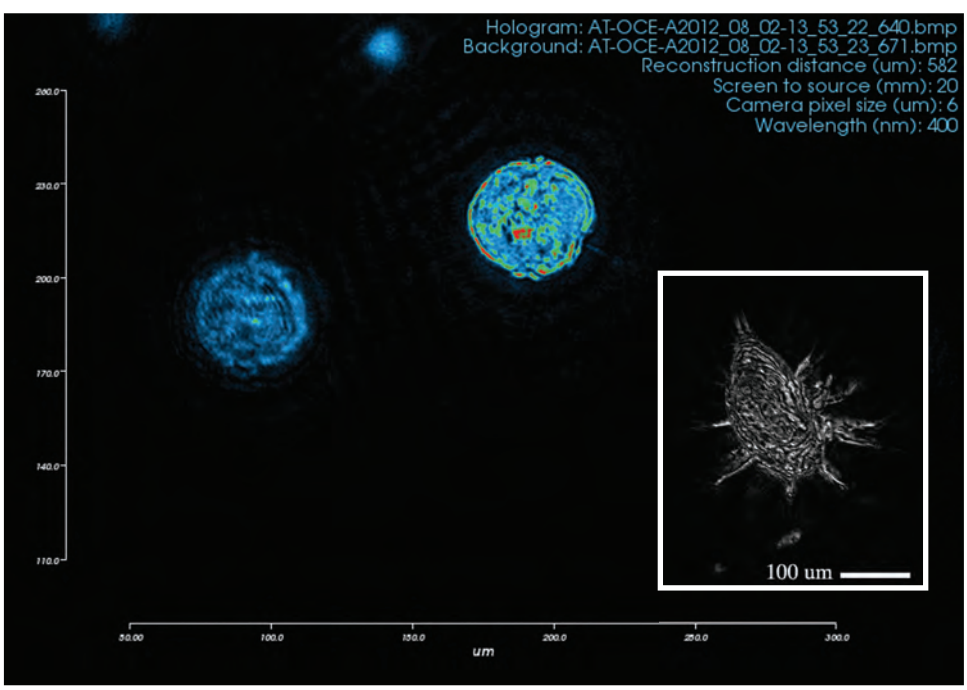
The microscopes are manufactured in Halifax. Up until mid-December 2013, the company had sold 12, the majority of those are in China.

"It is not a big number but we have really only been trying for a year and half," said Jones. "We have been actively promoting it and I expect next year we will sell between 30 and 40 minimum."

The submersible microscope with computer and hardware is sells for $50,000, which Jones says is compatible with the competition.

Resolution Optics has signed two agreements in China and Japan with distributors who have expertise in water monitoring. He anticipates those agreements will start showing positive results by mid-summer.

But as a young company, the major challenge is raising money. "We are heavily dependent on research grants and all of our work is eligible for R and D tax credits. Those two components are pretty important for us until we generate enough revenue to be self-sufficient," he said.



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New MASK Unveiled

This facility makes waves ... literally

By Edward Lundquist

Before sending a new ship to sea it helps to know how well it will perform, especially in rough seas. Testing and improving the seakeeping qualities of ship designs is an art that requires a combination of computerized modeling and simulation, scale model testing in a wave making tank, and actually taking a ship to sea.

The modernized Naval Surface Warfare Center's Maneuvering and Sea Keeping (MASK) wavemaker was unveiled at a dedication ceremony on Dec. 19 at the NSWC Carderock Division's West Bethesda, Maryland, facility. The MASK is named for long-time Carderock hydrodynamics pioneer, the late Harold E. Saunders.

The upgraded facility, which replaces an obsolete wavemaker, is housed in a dark, cavernous building with an arched rood like a giant Quonset hut. Every note of the national anthem, sung by Peter Eobbi of NSWC Carderock's Ship Systems Engineering Station in Philadelphia seemed to hang in the air.

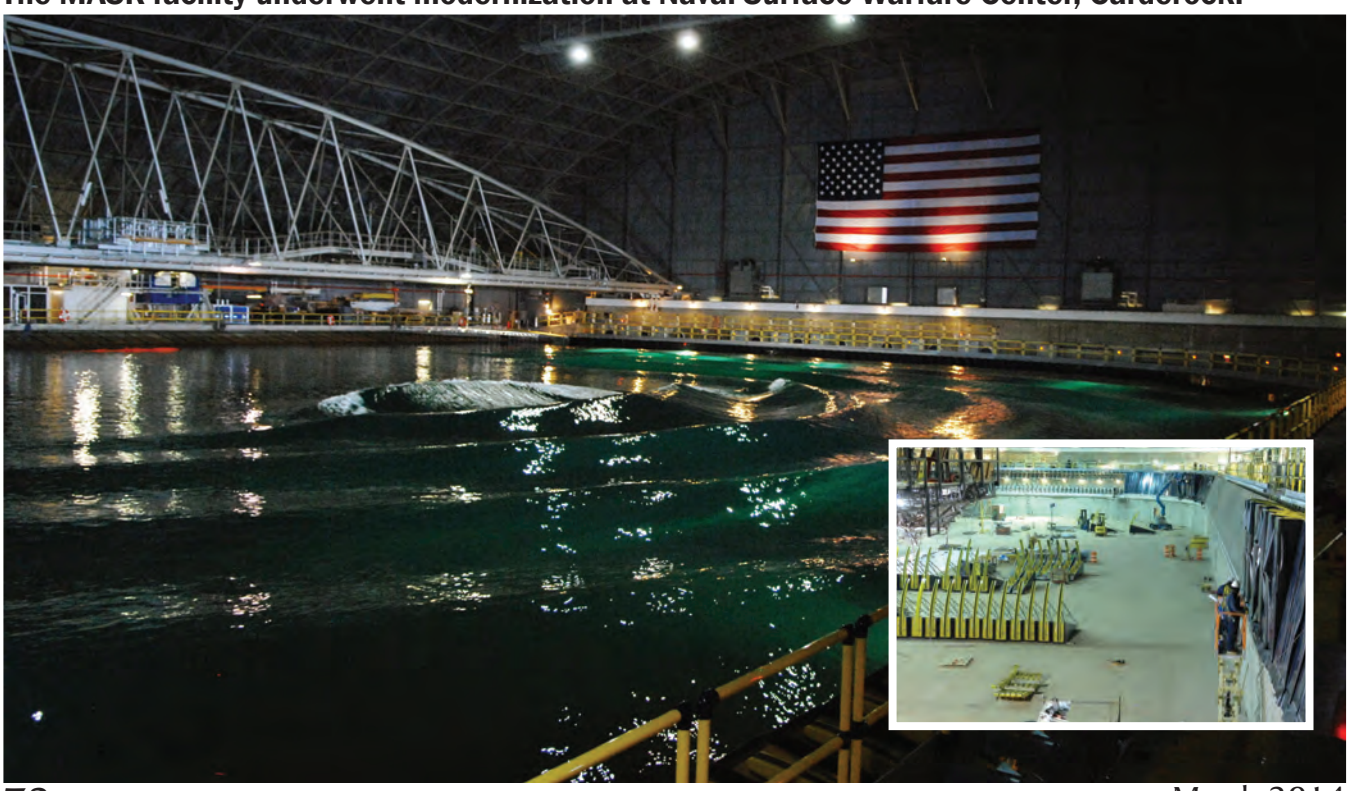
Although not as large as Carderock's famous David W. Taylor Model Basin tow tank, the 12 million-gallon MASK basin will allow researchers to test how ship designs handle in every possible sea condition.

The basin is 360 feet long and 240 feet wide and can accommodate scale ship models up to 30 feet in length. The dark blue-green water is about 20 feet deep except for a trench where the water is 35 feet deep for testing submarine models.

The waves are generated by a system of 216 electro-mechanical panels called wave boards. The new system replaces the old pneumatic system installed when the facility was first opened in 1961.

An overhead carriage can "tow" the

The MASK facility underwent modernization at Naval Surface Warfare Center, Carderock.



(U.S. Navy photo by Devin Pisner/Released)

Naval Surface Warfare Center, Carderock Division Naval Architecture & Engineering Department Head, Jon Etxegoien, right, Naval Surface Warfare Center Commander, Rear Adm. Lawrence Creevy, Dr. John Holdren, Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-Chair of the President's Council of Advisors on Science and Technology, NSWC, Carderock, Commander Capt. Richard Blank, and NSWC, Carderock, Technical Director Dr. Joseph (Tim) Arcano cut a ribbon during the opening of the MASK facility.

models, although most models today are self-propelled and operate with remote control.

The upgraded facility, completed at a cost of nearly $25 million, has not been used to test a ship model yet, but officials say that will happen starting in March.

Although a state-of-the-art facility when built in 1961, with the old mechanism, waves could only be generated in one direction. "Now we have the precision and ability to generate more precise and different wave patterns," said Tim Arcano, PhD, Carderock's technical director.

The waves are generated by the individual wave panels moving together along the side of the pool. They not only create wave patterns, but can be used to dampen waves and return the pool to a flat surface.

"We get so much more out of the tank with the new wave maker paddles, and much better and productive use of the testing time," Arcano said. "It used to require a 15-20 minute wait before starting the next run. Now it takes about 45 seconds to return the basin to normal. This time frame that allows us to start the next test run 45 seconds later is totally new for us."

"We develop realistic naval ship models up to 30 feet run them through different types of waves in order to run them through the stresses before they would actually encounter them at sea," Arcano said.

The active panels impart and absorb wave energy to induce and reduce the waves; permitting the creation of different headings, wave-heights, periodicity and event "focused wave events" not found naturally in the ocean environment. As part of the demonstration, a crowd-pleasing, not-found-in-nature "donut wave" was generated.

"The control we have over these waves is amazing," Arcano said. "For both in-service and future ships, we can test here in a small scale in our basin and identify safe operating envelopes for our ships and validate the environments that the ship might operate in.

Arcano said that Carderock has performed hydrodynamics testing on virtually every single ship platforms in the Navy fleet in the MASK facility. "The modeling and simulation, testing and design of almost every Navy ship all started here at Carderock. We have been able to validate the designs and dramatically reduce risk," Arcano said. "We're looking forward to testing the new ship designs here."

According to Jon Etxegoien, head of naval architecture and engineering department, Carderock engineers and scientists will use the new MASK facility along with the 3,000 foot high speed and deep water towing basins and the Large Cavitation Channel in Memphis to study advanced hull forms and ship designs for seakeeping studies and survivability at sea. "There's a small degree of overlap, but each facility has its own unique features."

"We'll do straight line testing for resistance and power in our long basins. We can test the hull for response amplitude with uniform waves, then start increasing the period or height and looking at how the ship reacts to that," said Etxegoien. "But here we can conduct maneuvering and control to evaluate a hull's seakeeping qualities. We can see how it reacts to different sea conditions."

"We used to mount the models on the carriage and run them at different headings into a sea, obliquely to a sea, or with a following sea. Now, with new wave maker, we can actually control the angle of the waves. We can simulate a more natural sea state, such as wind-driven seas with a swell from one direction. If we expect a ship to be deployed to an area with a lot of big swells we can test and see how that design will handle that situation, and see how it responds to really adverse situations," said Etxegoien.

When Carderock engineers evaluate hull designs, they first build a computer model. Then they conduct testing with scale models, which informs the model. Then they test in real conditions, and reality informs both. "With new wavemaker, we can test and make sure our simulations are good," said Etxegoien.

The new system will make testing simpler, Etxegoien said. "It used to be

a difficult system to use over long tests, requiring very experienced operators. You couldn't change angle of waves, so we would have to change the angle of the model. We couldn't create the steepest waves. The new wavemaker will be much easier to use and allow for more complete testing."

Etxegoien said the navy knows a lot about the kinds of seas its ships may have to sail upon. "We can create what we might expect to find because we have that data. We have 20 years of experience of on increasing and improving the data of the conditions in those areas where we expect to operate."

There are other wavemaking facilities for performing hydrodynamic testing of ship models—such as in the Netherlands, Germany, China, Japan and Brazil—but Arcano said none can do what the Carderock team is able to accomplish today. "This is the most advanced of its class in the world."

As a major component and field activity of the Naval Sea Systems Command, the Carderock Division is the Navy's center of excellence for ships and ship systems, providing cradle-to-grave technical support for surface and undersea platforms. Carderock is the full-spectrum research and development, test and evaluation, engineering, and Fleet support organization for the Navy's ships, submarine, military watercraft, and unmanned vehicles.

The Carderock Division consists of approximately 3,200 scientists, engineers and support personnel working in more than 40 disciplines ranging from fundamental science to applied/in-service engineering. The Hydromechanics Department researches hull forms, propulsion and ship dynamics to provide the foundation for new ship and submarine designs.

In delivering his keynote address as the "grand opening" ceremony for the upgraded facility, Dr. John Holdren, director of the White House Office of Science and Technology Policy Saluted Carderock for its spectrum of work from fundamental science to direct technical support of Navy acquisition programs and operational units, to include work to reduce acquisition and operating costs.

Holdren acknowledged that global competitors are focusing on science and engineering, making it vitally important for America to "maintain the intensity of our own investments [in science and technology] so we can keep our national security science and technology base healthy and ready to respond whenever needed."

The MASK is named for the leading American hydrodynamicist of the 20th century, Harold E. Saunders, who was also a Navy captain and a member of two of Admiral Byrd's expeditions to the Antarctic. Members of the Saunders family were present at the ceremony.

Global Diving & Salvage CEO

Devon Grennan

Devon Grennan was named CEO of Global Diving & Salvage in November 2013 after company founders Tim Beaver and John Graham stepped down from direct operational involvement. MTR caught up with Grennan for his insights on the business of Diving and Salvage.

By Eric Haun

(Photo: John Vicory)

Your title is new, your tenure is not. How is your company the same as it was in 1995?

We still focus on making sure that our customers receive the best service, regardless of the services they need. Between commercial diving, marine construction, casualty response and marine environmental services, we endeavor to put our best foot forward and make sure our clients get from us what they requested, and usually a little more. That was the approach our founders had over 35 years ago, and it is a simple approach for us to continue to this day.

How is it different? What have been the most important developments?

The most importance difference that I see is that when the company was founded, there was a group of dedicated professionals who developed their respective skills during a time when both the commercial diving and marine environmental industries were themselves going through great changes. There was a tremendous opportunity for "on the job" training. There is a different expectation now from maritime clients; they desire professional tradesmen working on their projects and facilities. The entry level employees at our company have the basic skills to dive and work in the field, but are having to invest in their professional development, specifically in construction trade skills such as welding, fabrication, mechanical inclinations, rigging and vessel operations. These are truly the services that our clients expect from us, and not simply having the ability to dive. We focus on the skills that a diver or environmental technician brings with them to the job site. This is a different approach than learning on the job as the sole source of professional development.

How will your ascension to this position and Tim and John's "stepping back" have a material impact on the company?

My job is to build upon the incredible foundation that is already in place, built not only by Tim and John, but by a remarkable group of experienced managers, support personnel, supervisors and field crews. I think I bring a different perspective on the overall opportunities that the company is capable of capitalizing on in the future; we have amazing depth and expertise in commercial diving, but we are at a point where we need to move beyond diving. It will always remain a core service that the company provides, but we need to move into new sectors of subsea services as well as providing a complete subsea experience for our clients. Our clients are desirous of more topside project management capabilities, as well as marine assets under our direct care.

Where do you see opportunity?

The domestic Gulf of Mexico market is a more short term opportunity for the company; we have a lot of room to grow in the offshore market since the opening of our office in Houston in 2011. Our position in Alaska also has tremendous possibilities with the focus on the arctic. We also feel that there is a tremendous opportunity in the international market in our core strategic service lines. We will have more international credentials by the middle of 2014, and there is a unique opportunity for us to bring our own brand to new clients in the oil and gas market.

How is Global Diving & Salvaging investing?

The largest investment we are making over the course of the next few years is internally with our professional development program. We are focused on our own training center concept, and creating a more well rounded diver and marine technician. As mentioned earlier, we are going to create our own training approach, taught by our own employees and supplemented with third party expertise, to ensure that we maintain our unique Global culture as well as to develop skill sets across the various regions in which we operate and the service lines which we excel in. For example, we are in the process of designing and building wet welding tanks at all of our regional offices to allow our divers to qualify and maintain their welding certifications. Our professional development program will extend beyond practical training just for field crews, but also into leadership, management of personnel, supervisory practices and many others areas for all employees levels throughout the company, including our senior management team and myself. We are focused on the concept of continual improvement, evaluation, and personal and professional growth for our employees. We are a traditional service company, and at the end of any business evaluation we make, our future success is tied directly to the skills of all our employees. It is the smartest investment we could ever make.

Where do you see the greatest current business challenges?

For Global, the greatest challenge is our need to continually adapt to the needs of our clients. Subsea work is continually moving further offshore and deeper. Developing capabilities to respond to those needs, which include unmanned operations. Clients desire for us to take on a greater scope of the overall operation, so we invest in engineering and project management and evaluation on owning larger marine assets. Internally, we are constantly looking at not only how to develop our professional trademen, but as importantly, how to develop and retain talent in our support groups. I was fortunate to grow up in an extended family who worked on the water, and it was very natural for me to want to continue that tradition. But as an industry, the maritime community needs to do a better job of marketing the benefits and opportunities that are available to younger generations, across the board.

McMurtie

Pedersen

Signell

Ferland

McMurtie Takes Helm at iSURVEY

iSURVEY Group, a provider of survey and positioning services to the global oil and gas and telecommunications sectors, announced the launch of a new offshore division as part of U.K. growth plans. Based in Norway, iSURVEY Group is establishing a new Aberdeen-based entity supporting clients operating in the U.K. North Sea and other global regions, including the Mediterranean Sea and Africa. Recruitment has started and it plans to have 30 staff in place by the end of 2014. Key to the establishment of iSURVEY Offshore Limited is the appointment of Andrew McMurtrie as managing director, which will see him take responsibility for growing international business through the new division.

Pedersen New EIVA Chairman

The Board of Directors of Danish EIVA a/s is headed by Flemming Bligaard Pedersen as of January 14, 2014. With the appointment of the new chairman, the offshore service and equipment provider prepares to further strengthen its business in the light of the growth it has seen in recent years.

Pedersen has technical understanding and many years of management experience from a career that has included involvement in the offshore industry. For nearly 20 years, he was part of the top management of Ramboll that specialises in engineering in the construction, transport, environment and energy markets. With CEO being his most recent position, Pedersen contributed significantly to the strategic development of the company.

Under Pedersen's management, Ramboll grew from being a primarily Danish company with 800 employees to an international concern with close to 10,000 employees and more than 200 offices in 21 countries. Among other initiatives, this included establishing activities in the offshore sector.

Signell, Ferland Join Hydroid

Hydroid, Inc., announced organizational changes to its management team. Libby Signell was appointed as vice president of operations. Signell, most recently program manager at Hydroid, brings to her new position more than 30 years of engineering and program management experience. She has previously worked at the Woods Hole Oceanographic Institution and Lockheed Martin. Signell holds a mechanical engineering degree from the University of Michigan and is a certified Project Management Professional (PMP).

Leading Hydroid's team of engineers will be Julie Ferland, the company's new vice president of engineering. Ferland comes to Hydroid from her most recent position as vice president and principal engineer at Maritime Applied Physics Corporation (MAPC). Ferland is a former US Navy officer and salvage diver. She is a Harvard University graduate with a BS in Mechanical Engineering, and holds a Master's degree in Civil Engineering, Naval Architecture and Marine Engineering from the Massachusetts Institute of Technology (MIT).

Marino Promoted Manager at PMI Industries

Jay Marino has been promoted as the manager of PMI Industries, Inc. Laboratory Services and Government Engineering operations. In this position, Mr. Marino is primarily responsible for overseeing and managing the subsea cable and hardware testing laboratory functions for the company. He also will serve as the liaison between PMI and various domestic and international government agencies, as well as independent contractors.

Previously, Marino was the Manager for PMI's Engineering Department that develops subsea cable hardware. He joined PMI in 1985 as a project engineer. He is a 1984 graduate of Cleveland State University with a Bachelor of Mechanical Engineering degree. Marino received his Ohio registered Professional Engineering certification in 1993.

Schillinger Joins RBR

RBR added Douglas Schillinger to its sales team. Schillinger joins as RBRs Scientific Sales Representative for Atlantic Canada and East Coast U.S. region. Having spent the past 13 years working both for the Ocean Acoustic Lab at Dalhousie University and as a private consultant, Schillinger brings a wealth of knowledge and experience. Schillinger obtained his M Sc. from Memorial University, studying ambient sound in the ocean generated by wind and precipitation; over his career he has worked as a research assistant, project manager and research associate on a range of topics including marine mammal detection, near shore sediment dynamics, real-time coastal and regional scale ocean observatories, and most recently on in-stream tidal power.

Teledyne Expands N. Falmouth Facility

Teledyne Marine Systems expanded its facility in North Falmouth, Mass. The new 30,000 sq. ft. addition expands Teledyne's North Falmouth facilities to approximately 67,000 sq. ft. and boasts greatly enlarged research and development labs, service facilities, and office space. The existing building has also been partially renovated to add approximately 10,000 sq. ft. of first-class manufacturing floor space. This 22-acre campus-like setting in North Falmouth includes two buildings and will be the home of Teledyne Benthos, Teledyne TapTone, Teledyne Webb Research and U.S. sales and support for Teledyne Gavia.

Photo: Teledyne

Carsely Tapped by Coda Octopus

Coda Octopus has established a new company in Perth, Western Australia: Coda Octopus Products Pty Limited. This new office will be a sales, distribu-

Carsely

Sobeck

Morrison

Lee

tion and support office serving in the first year Australia, New Zealand, Japan and Singapore and will provide customer support, technical know-how, products and personnel for projects in the region. This new regional base for Coda Octopus follows a number of very interesting projects in the oil and gas and marine salvage sectors undertaken in the region over the last few months where the Coda Octopus real time 3D sonar, Echoscope, has brought significant operational and safety benefits for customers in the frequently turbid waters around Australia. Robert Carsley has been appointed as CEO of this newly formed Company.

Sobeck New at NOAA

Eileen Sobeck was appointed assistant administrator for NOAA Fisheries. She assumed her new position on January 27, taking the helm from Samuel Rauch, who has served as acting assistant administrator since 2012. Rauch will return to his previous position as deputy assistant administrator for Regulatory Programs.

Sobeck is a graduate of Stanford University and Stanford Law School. She also has the honor of having a species of Pacific nudibranch, Hallaxa hileenae, named for her. She has been snorkeling and diving all over the world, most recently on a trip with her family to Indonesia.

Ashtead Appoints Lee, Morrison

International subsea equipment solutions specialist Ashtead Technology strengthened its global team with two key appointments in its Singapore and Aberdeen offices. Wendy Lee was appointed regional general manager in Singapore and Paul Morrison was appointed key account manager in Aberdeen.

Seatronics Promotes Middleton

Seatronics, an Acteon company, promoted Phil Middleton to deputy managing director based in the Aberdeen office. Middleton has 18 years' experience in the oil and gas industry and 13 years within the rental market. During this time, he has demonstrated expertise in engineering, operations, commercial and business development. Middleton's qualifications include a BEng Hons degree in electronic and electrical engineering from Robert Gordon University.

Management Changes at Ellicott Dredge

Ellicott Dredge Enterprises announced two personnel changes to its senior management team. Gert de Vries has joined as Senior Director of Engineering, in which capacity he will be supporting the engineering departments of all of Ellicott's brands, principally Ellicott and Rohr-Idreco. He will also be mentoring the company's engineering teams. Rob Schettle has been promoted to General Manager at Ellicott's subsidiary Liquid Waste Technology. He will now be responsible for running Ellicott's plant in New Richmond, Wisconsin.

Sonardyne Appoints Gleeson VP for Asia

Sonardyne International Ltd. announced the promotion of Anthony Gleeson to the position of Vice President Sonardyne Asia Pte, based in Singapore. Gleeson joined Sonardyne in 2009 and brought with him a wealth of knowledge and experience from his previous sales and offshore engineer roles at Teledyne TSS and Seistech Offshore. During his time so far with Sonardyne, he has been highly influential in developing business opportunities in the region, particularly in China.

Propeck Joins Global Diving

Global Diving & Salvage, Inc. hired John Propeck as General Manager for their Gulf Coast regional office, located in Houston.

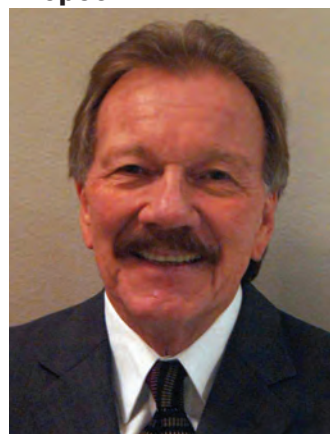
The company adds that Propeck brings with him over 45 years of multifaceted experience in the commercial diving

Middleton

Schettle & de Vries

Gleeson

Propeck



and maritime industry. He began his career as a commercial diver, logging over 1,000 days in saturation. He has over 20 years of program and project management experience, including business development, marketing, sales, purchasing and procurement management. Propeck will be responsible for the day-to-day undertakings of this region both administratively and operationally. He will lead the development of new and ongoing business opportunities within Global's core service lines: Offshore Operations, Marine Construction, and Casualty Response.

EMAS Wins $80m in Subsea Projects

EMAS announced that its Subsea Services division (EMAS AMC) has been awarded projects worth a total of approximately $80m, including options. The scope of these projects cover a large spectrum of subsea work, including the decommissioning and towage of an FPSO in Asia and the deployment of an Inspection, Maintenance and Repair (IMR) vessel in the Americas. Work for a majority of the contracts is expected to commence by the first half of 2014.

Fugro Software for Cable Route Design and Data

Fugro Pelagos introduced the Cable Analyst II, a new software solution for designing, engineering and managing submarine cable routes.

Cable Analyst II is an extension to Esri's ArcGIS for Desktop and takes advantage of its rich geospatial functionalities. With a logical data model and intuitive, process-oriented tools, Cable Analyst II streamlines the workflow for performing analysis and providing the information needed for designing a submarine cable route.

It is equipped with capabilities to efficiently populate, manage and track cable databases.

The ArcGIS platform opens the door to numerous possibilities for implementing design criteria such as creating custom models and scripts and assessing various layers to study risk, cost and environment. Satellite imagery, electronic nautical charts, web mapping services and marine data obtained from public and private sources are also readily accessible.

Subsea Expands Rental Pool

Pictured at Subsea Expo in Aberdeen: Scott Johnstone (STR), Neil Jackson (STR), Simon Goldsworthy (Sonardyne) and Hollie Moran (STR).

Continuing its investment in Sonardyne 6G acoustic positioning technology, Subsea Technology & Rentals (STR) boosted its rental stock with the purchase of Ranger 2 USBL tracking systems, a Lodestar GyroCompatt, Wideband Mini Transponders (WMTs), LBL Compatt 6 transponders with specialist inclinometer DigiQuartz sensors and ROVNav 6 transceivers from Sonardyne International Ltd. The equipment has been added to the company's rental pool in Great Yarmouth from where it is available to support survey and construction projects worldwide, reaffirming STR's drive to offer a one-stop solution to the industry.

Canadian Underwater Conference & Expo

The 6th Annual Canadian Underwater Conference & Exhibition is returning to Toronto, April 6-8, 2014. This event, to be held at the Toronto Airport Marriott Hotel, will focus on Canada's dynamic underwater industry and expects to welcome approximately 150 delegates and 26 exhibitors representing both the onshore and offshore underwater community. Twenty-two speakers representing Canada, the U.S., the U.K. and Australia will deliver cutting edge technical presentations, the event's organizer said, adding that an influential keynote speaker scheduled to speak at Monday's lunch promises to create a memorable experience. Always a highlight of the conference, the Technical Contributions Award will be presented to a deserving individual at the Awards Banquet on Monday evening. To nominate someone who has made significant contributions to the Canadian diving industry, please complete the nomination form located on the website below.

www.underwaterconference.ca

Shell's GoM Platform Starts Production

Shell has begun production from the Mars B development through Olympus, the company's seventh and largest floating deepwater platform in the Gulf of Mexico.

It is the first deepwater project in the Gulf to expand an existing oil and gas field with significant new infrastructure, which should extend the life of the greater Mars basin to 2050 or beyond. Combined future production from Olympus and the original Mars platform is expected to deliver an estimated resource base of 1 billion barrels of oil equivalent (boe).

"With two large platforms now producing from the deepwater Mars field, this project demonstrates our deepwater project delivery and leadership," said John Hollowell, EVP for Deep Water, Shell Upstream Americas. "Deepwater will continue to be a core growth opportunity for Shell."

Photo: Shell

In addition to the Olympus drilling and production platform, the Shell Mars B development (Shell 71.5% operator, BP 28.5%) includes subsea wells at the West Boreas and South Deimos fields, export pipelines, and a shallow-water platform, located at West Delta 143, near the Louisiana coast.

Olympus sits in approximately 945 meters (3,100 feet) of water. Using the Olympus platform drilling rig and a floating drill rig, additional development drilling will enable ramp up to an estimated peak of 100,000 boe per day in 2016.

The Mars field produced an average of over 60,000 boe per day in 2013.

Warning for Breathing Gas Users

Dr. Andrew Hobson from Quantitech, a specialist analytical instrument company, is urging the users of breathing gas to check that their supplies are tested for all potential contaminants, and not just the most common compounds. He said, "It is important to use an analytical technique such as FTIR because this methodology provides a spectrum result in addition to concentration measurements for a wide range of parameters," adding, "This is important because unusual peaks occur in the spectrum when unknown contaminants are present."

The standard BS EN 12021 requires that all contaminants should be kept to as low a level as possible and shall be not greater than 10% of the UK 8 hour time weighted average exposure limits which are specified in the HSE publication EH40. However, contamination can occur when gases or vapors are drawn into a compressor accidentally as a result of a leak or a spillage, or from a nearby chemical reaction or combustion process. As a result, any analysis of the compressed gas that only measures specific compounds is unlikely to detect any unforeseen contamination and this is the reason for FTIR being the preferred analytical technology for breathing gas analysis.

Corporate Spotlight: MacArtney

Record Growth in North America

Following a major expansion which saw new MacArtney offices open in every coastal corner of the North America and added several new faces to the team, MacArtney is looking to experience record breaking growth within North American markets for underwater technology. This marks a key contribution to the overall strategic ambition of the MacArtney Group to double turnover between 2010 and 2015.

This positive forecast is especially empowered by a booming oil and gas sector operating out of Houston, Texas, where the regional headquarters of MacArtney is housed. "We are stepping up efforts to accommodate the increase in demand for complete solutions to take on complex challenges within various underwater technology related industries," said Lars Hansen, President of MacArtney in North America, and continued: "While some of the underwater technology products and systems offered by MacArtney, like SubConn connectors, have grown to reach a position as world-leading, others, such as MERMAC and CORMAC winch and handling systems, Mac API harsh environment connectors, MacArtney NEXUS multiplexers and LUXUS Cameras and Lights hold a vast potential."

As part of a broad response to this increase in complete solution demand, experienced industry professional Scott Allen has recently taken the helm as System Sales Manager with MacArtney in Houston. Adding further strength to the MacArtney team, MacArtney has secured the talent of Scott Walters to function as Item Sales Manager. Long-time MacArtney employee, Rafael da Costa Lima, will take on new tasks as Internal Sales/ Project Manager, strengthening the ability of the Houston team to manage and deliver large projects and complex system solutions.

MacArtney Adds Pressure Test Facility

MacArtney France added a modern and fully equipped pressure test facility to its workshop in Rousset. Being unique to the French market for underwater technology, the new facility represents a notable extension of the MacArtney France service portfolio. Empowered by the newly installed pressure vessel system with a height of 1,100 mm, an internal diameter of 650 mm and a pressure capacity of up to 600 bar - the test facility is able to submit underwater connectors, cables, moldings, junction boxes and other types of equipment to extensive ocean depth pressure tests. For optimal accuracy, the pressure vessel system is capable of preprogrammed and fully computer controlled operation with all measurements undertaken and recorded in real-time.

To ensure flexible connectivity to equipment tested inside the tank, six penetrator passes are incorporated into the vessel lid. Moreover, an overhead crane with a capacity of 4,000 kg ensures that even very heavy or unwieldy equipment can be pressure tested. The MacArtney France pressure test facility offers reinforced safety operations and is available for rental on an hourly or daily basis, with all testing performed by fully trained and certified MacArtney technicians.

Photo: MacArtney

MacArtney France's new Pressure Test Facility.

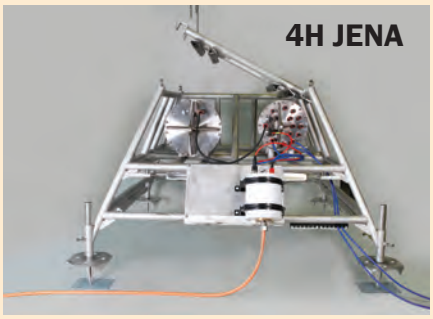
OI 2014 Technology Preview

This month the global subsea community gathers in London for Oceanology International 2014. MTR examines new technology set to debut.

2G Engineering

2G Engineering offers a full range of electric subsea rotary and linear actuator systems. These units are unique in that they are fully self contained requiring nothing more than power and a digital or analog control signal to operate. 2G is excited to introduce two new products, it's Mini Rotary Actuator with an output rotational force of 1000 ft. lbs. and it's Subsea Hydraulic Pressure Unit capable of 5000 PSI with 0.5 GPM flow. All units are capable of operating depths greater than 10000 ft."

4H JENA



4H- JENA engineering GmbH has a large and diverse portfolio. It develops systems to monitor physical and biological-chemical water parameters in close consultation with our customers. It puts emphasis on autonomous measurement systems equipped with anti-fouling procedures to ensure high quality data for a long-term operation. Its spectrum ranges from small low-power flow-through systems, FerryBoxes and complex seawater supply systems on research vessels to mesocosms and underwater nodes. To comply the requirements of the water framework directive automated litter, plankton and passive sampler have been developed.

AML Oceanographic

AML Oceanographic (AML) has partnered with OSIL to offer Xchange sensor recalibration services at OSIL's facilities in the U.K. With a European recalibration center, field-swappable sensor-heads become even more convenient for European users of oceanographic instrumentation. OSIL is expected to begin accepting Xchange sensor-heads for recalibration by March 1, 2014. AML's Xchange line is a series of field-swappable sensor-heads. Each sensor-head contains its own embedded calibration, allowing the sensor to work with any AML instrument. Field-swappable sensors also streamline recalibration: instead of sending the entire instrument back to a calibration center, a recalibrated sensor-head can be delivered to the instrument in the field.

Instrument downtime is dramatically reduced. Established in 1974, AML Oceanographic (www.amloceanographic.com) designs and manufactures innovative instruments for the ocean sensing market. AML is headquartered in Victoria, on Canada's Pacific coast. OSIL (www.osil.co.uk) provides marine instruments and systems for environmental measurement and monitoring. OSIL also provides a range of high precision calibration standards for measuring salinity including IAPSO Standard Seawater, Low Nutrient Seawater and Iodate Standards. OSIL is located in Havant, near Portsmouth.

Amron International

Amron International has developed the Model 8330i, an integrated air control, depth monitoring (pneumo) and optional communication unit for up to 3 surface-supplied divers. Designed to meet

Amron Model 8330i

the IMCA guideline that "no other diver is deprived of breathing gas if another diver's umbilical is cut or ruptured," the Model 8330i features independent high- and low-pressure air supplies for all 3 divers. The inclusion of crossover valves between the 3 air supplies, each of which has been designed by Amron to safely accommodate up to 3 divers by itself at one time, provides dual backups in the event of an emergency affecting 1 or 2 divers, such as air supply contamination or failure.

In addition to the air control section, the Model 8330i features a pneumo panel with 6-in. depth gauges capable of registering depths up to 250FSW/76MSW and an optional panel-mounted version of Amron's Amcom III radio module for diver communication. The unit is entirely self-contained and is housed in a durable, pressure-fused fiberglass case.

Caley Ocean Systems

Caley Ocean Systems is a supplier of offshore handling systems for ocean science and oceanographic research. It supplies high specification A-Frame, single point lift, launch and recovery systems for manned submersibles and Conduc-

Caley A-frame

tivity, Temperature, and Depth (CTD) Rosette Handling systems. In addition, the company offers a full range of ROV, AUV and dive handling solutions, certified by the leading certifying authorities and in full compliance with industry standards. Caley has many years experience in the design and manufacture of bespoke traction, storage, umbilical and Abandonment and Recovery winches for demanding oceanographic applications to depths of 10,000m.

EvoLogics

EvoLogics presents at OI 2014 new developments in their hydroacoustic navigation and communications systems. The highlight is the introduction of the new mini-modems with the same performance as the previous models. These models will facilitate the integration in ROVs and AUVs to enable simultaneous positioning and communication. In addition, new advances in underwater networking capabilities such as DTN and DDTN protocols will be presented for applications with a need for extra reliability. Navigation and positioning have become more flexible through the integration of LBL and USBL with inertial navigation systems. Sonobot, an autonomous surface vehicle, includes now novel applications for hydrographic survey of coastal areas and security of harbors.

Fischer Connectors

Fischer Connectors has been designing, manufacturing and distributing high performance connectors and cable assembly solutions for 60 years. Known for its reliability, precision and resistance to demanding and harsh environments, Fischer Connectors' products are commonly used in fields requiring faultless quality such as all types of oceanology and marine technology applications.

Fischer Connectors' high-performance, reliable, push-pull connectors are light, compact and rugged. We work closely with customers and partners to develop innovative reliable products that satisfy our clients' needs. Primary design and manufacturing facilities are located in Saint-Prex, Switzerland, with eight subsidiaries and over 25 distributors located worldwide.

Geomara

Geomara is launching its Subsea Asset Protection and Intervention Service at Oceanology International 2014.

Geomara will provide emergency response, fault finding and intervention services to Irish and UK subsea interconnector asset owners. The service will extend to communications (fibre optic cable), electricity and gas cable assets.

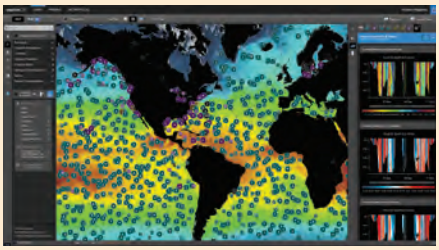
Having successfully completed a fault identification programme in 2013 Geomara are currently working with Mutual Energy on an HVDC cable fix which will highlight Geomara's innovative approach to subsea asset protection and intervention.

We also provide an extensive range of interrelated maritime services which have a strong focus on efficiencies created through interoperability capabilities.

Marineexplore

Marinexplore, the expert in ocean data, cloud services and big data, presents marineOS, a cloud-based data management solution that streamlines dataflows within a single extensible platform. MarineOS helps offshore and maritime businesses reduce their data handling time five-fold by improving data reliability to enable faster, more informed decision-making. MarineOS delivers

MarineOS Data Studio



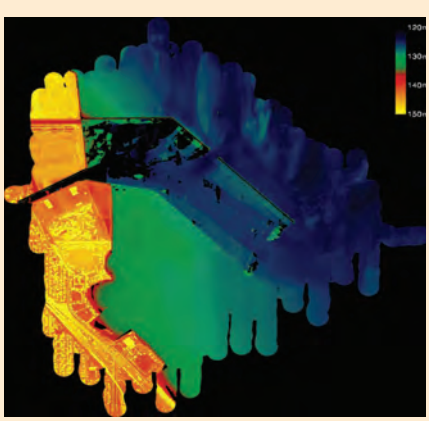
powerful, easy to use tools for ingesting, organizing, analyzing, visualizing, and securely distributing ocean data to partners, clients, and internal teams.

OceanTools

OceanTools is an independently owned, world leading subsea engineering company specializing in the design and manufacture of subsea equipment. Deployed in harsh environment applications including subsea survey and ROV operations, OceanTools products are field proven, trusted and reliable. Visit Stand P110 for: positioning and orientation packages, leak and cement detection, video, optical and image enhancement systems, subsea instrumentation and high precision laser measurement. With highly experienced subsea engineers on stand we look forward to discussing your engineering and project requirements. Sharing the stand this year is our sister company OTAC, displaying its latest aquaculture related products including seal deterrents.

Optech

Optech will showcase the Optech CZMIL in booth G100 at OI14. Optech pioneered advanced airborne lidar



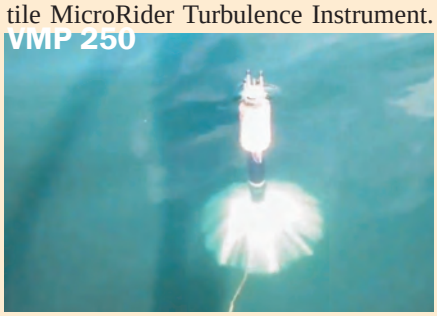
systems for bathymetry, and offers the full-waveform CZMIL, a system for seamless depth accuracy in both clear and turbid conditions. Currently there are five in use by government agencies. Leveraging the comprehensive HydroFusion planning and automated processing workflow, CZMIL produces simultaneous bathymetry, water column characterization, object detection, and seafloor classification. CZMIL is the only system actively producing seamless land-to-water 3D data and imagery, performing well even in shallow turbid or muddy bottom waters.

Remote Ocean Systems

The new C600 color zoom camera puts you in control. Its user-selectable SD and HD functionality offers great flexibility and value.
Key features and specifications include: 30x optical zoom; 4,500 meter depth rating; Titanium housing; 66° field of view (diagonal) in water at full wide; angle zoom level; Field replaceable connector available for analog configurations; and Water corrected hemispherical viewport, among others.

Rockland Scientific Inc.

At OI 2014 Rockland Scientific showcases various applications of its versatile MicroRider Turbulence Instrument.



This modular sensor payload can be integrated with a wide variety of autonomous or moored platforms, such as gliders, AUVs or Wirewalkers. MicroRider is on display at Teledyne Marine, stand D100, or at Rockland Scientific, stand P200. Rockland Scientific develops and manufactures instruments for the measurement turbulence in oceans, rivers, lakes and laboratories. Applications for RSI sensing technology are in climate research, ocean renewables, pollutant dispersal, fisheries, and security.
Rockland Scientific has been awarded a contract to deliver a VMP-250 Turbulence Profiler to the University of Bergen, Norway. The VMP-250 system includes a buoyancy collar and remote-controlled weight release mechanism, allowing the profiler to be operated in an uprising configuration.

Rowe Technologies, Inc.

Rowe Technologies, Inc. (RTI) develops and manufactures advanced ADCPs and DVLs in the industry. RTI's state-of-the-art electronics design combined with advanced acoustic transducer technology provide ADCPs and DVLs that are robust, compact and flexible. Rowe has a wide variety of products for use in real-time or self-contained applications capable of handling conditions from shallow water to full ocean depth.

SBG Systems

SBG Systems released the Ekinox Subsea Series, a product family of survey-grade inertial systems designed for underwater applications – up to 6,000 m.
Based on the robust and cost-effective MEMS technology, the series includes the Ekinox-M, a Motion Reference Unit (MRU), and the Ekinox-U, an underwater Inertial Navigation System (INS).
The Ekinox Subsea Series integrates the latest MEMS sensors to offer robust, small-sized, cost-effective, but high performance MRU & INS.
Ekinox outputs survey-grade roll, pitch and heading (0.05°) at a high update rate, making it compliant with IHO standards. To obtain the most accurate and reliable navigation data, the internal Extended Kalman Filter fuses in real-time inertial and aiding information (DVL, RTK GPS, etc.). All collected data are recorded in the 8 GB data logger.

Silicon Sensing

Silicon Sensing specializes in the development and manufacture of MEMS gyros, accelerometers and IMUs suitable for a wide range of applications in the marine industry. The latest high performance single-axis MEMS gyros; CRH01 and CRS39, have outstanding drift characteristics which render them suitable as small, low-cost alternatives to larger and more expensive FOG gyros. Gemini dual-axis surface mount MEMS accelerometers offer excellent bias stability and are available in both flat and orthogonal packages, and in five different dynamic ranges from ±0.85g to ±96g. Typical applications include precise ship positioning systems, stability control, guidance and navigation.

Seamor Marine

SEAMOR Marine designs and manufactures the subsea SEAMOR Observation/Inspection-class Remotely Operated Vehicles (ROVs), and related modular accessories and devices. A range of robust ROVs, designed to maximize adaptability, portability, and ease of use, is available from SEAMOR Marine Ltd. and represented on a global level. Responsive technical services are available from our SEAMOR production, engineering and repair facility in Canada. These ROV systems are a cost-effective system with the ability to easily assemble a completely customized underwater system.

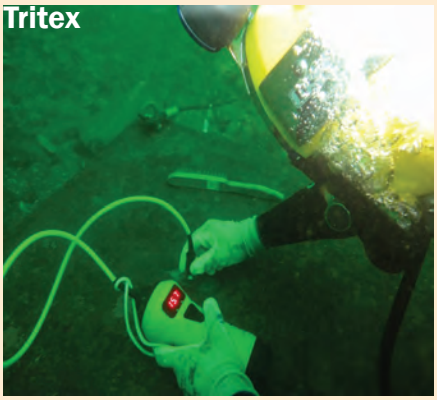
Sonardyne International
On Sonardyne's stand, G300, you can explore technology for acoustic positioning, inertial navigation, wireless communications and sonar imaging. Sonardyne's new Connect software for LBL metrology campaigns will be making its debut, as will the latest updates for Ranger 2 USBL. SensorView, a new software application developed for accessing raw sensor data direct from 6G instruments will also be on display whilst optical and acoustic communications technologies, BlueComm and uComm, will be demonstrating wireless video and camera imagery transmission. Outside on the water, Sonardyne will be hosting daily demonstrations onboard its Predator vessel in the dock where visitors can get discover more about the company's SPRINT INS, 6G LBL and 6G USBL positioning technologies. Sonardyne is also presenting papers and participating in panel discussions across Underwater Communications and Underwater Positioning and Metrology streams at the conference.

Subsea Technology & Rental
Subsea Technology & Rentals specialise in the design, production and rental of advanced subsea technology for the offshore energy industry. STR's in- house research and development team delivers enhanced solutions for seafloor investigation and inspection, along with bespoke engineering solutions. To complement its equipment supply service, its personnel can attend vessel mobilizations and support worldwide offshore operations. From its HQ in Great Yarmouth, Norfolk (UK) STR offers a range of services including pressure testing, sensor calibration, and fiber-optic cable termination and molding. STR will be showcasing its 4 channel HD SeaDV Inspection Recorder at stand K601.

SubCTech

SubCtech is an international operating company based in Kiel, Germany. As a developer of marine technology and underwater power supplies the company presents a product family of pCO2 analyzer, complete mobile and stationary environmental and condition monitoring systems and PowerPacks. On OI'14 the new PowerPack with enlarged capacity, special design opportunities and for applications up to 6000m are launched. In addition, the company launches the newest Datalogger technology which has reduced size, energy uptake and integrated power supply for Datalogger and sensors. See SubCTech at shared Booth R500 (Sea&Sun Technology) and RS Aqua Booth F550, its appointed representative for U.K. & Ireland.

Subsea Tech
Subsea Tech is an engineering company based in Marseilles, France, and specialized in design, manufacturing and sales of marine and underwater intervention and instrumentation systems. Subsea Tech manufactures and sells a full range of mini-ROVs, tele-operated catamarans and underwater camera systems. The main applications are: underwater and oceanographic surveys by video, sonar, bathymetry; fauna and flora video observation; seabed mapping by single and multibeam sounders; video and sonar inspections of underwater structures such as dams, harbors, bridges; ship hull inspections; water tanks video inspection and cleaning; objects identification by sonar and video.

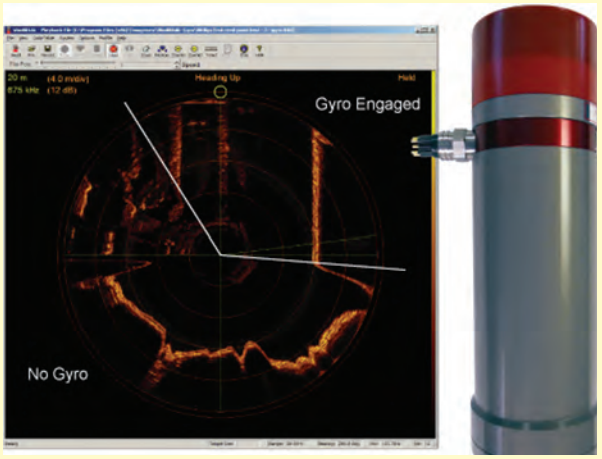


Tritex
Tritex NDT Ltd will be showing its Multiple Echo Multigauge 3000 Underwater Thickness Gauge which is designed to be a simple, robust underwater ultrasonic thickness gauge designed to survive extremely harsh conditions that exist in the offshore and underwater industries worldwide.
The gauge uses multiple echo which means measurements can be easily taken without the need to remove coatings, and the large bright 10mm LED display ensures the display can be seen by the diver, even in poor visibility. It has an integral battery with 55 hours runtime which means there is no need for a spare battery. Also, the gauge can be easily upgraded to a topside repeater by exchanging the end cap.

Unique System (U.K.) Ltd
Unique System (U.K.) Ltd, a Unique Maritime Group company, will participate at OI 2014.
Unique Systems will display several products like the Klein sonar, Tritech, Ixsea and Sonardyne 6G equipment, Unique Seaflex Air Lift bags, etc. A key feature will be the newly designed Unique Hydra eDMS100 dive monitoring system which is the first fully integrated surface diver monitoring system; operating via a PLC/PC based unit housed in a standard 19" electronics rack with remote "Sensor Stations" located at key areas around the dive system. The unit can be tailored to fit almost all current IMCA compliant diving systems.

Sonar Image Stabilization

A Powerful Tool



Most ROV pilots are familiar with the vanishing target problem when operating mechanically scanning sonar. During the approach with an ROV or any other moving platform, heading alterations of major proportion will often place sought-after targets outside of the viewing sector of the sonar on successive sweeps. What follows frequently, in order to relocate the object, is a sector increase on the sonar, as well as platform stabilization via contact with the bottom, which is time-consuming. Smaller unwanted changes in rotation of the sonar platform will either compress or expand the scanning density on the target, causing sufficient distortion of the displayed image to deny object recognition. The Imagenex Model 881L-GS sonar, which employs a low drift gyroscope as well as a magnetic compass, is designed to be capable of correcting for orientation changes at a rate in excess of 500 degrees per second, which allows it to compensate for sudden turns and inadvertent bumping or jarring. Therefore, scan lines are displayed without blurring, compression, or smearing effects in all modes of operation, be it polar, sector or North-up. The North-up mode references the sonar image to true north when using an appropriate variation input. Regardless of platform heading changes, the sonar is able to keep the target continuously at the center of the scanning sector. Positional changes of aspect relative to the target are easily compensated by clicking the "Set Gyro Reference" button on the screen.

www.imagenex.com

Scanning Sonar for Search and Survey

When an SUV went off a Minnesota bridge and into a river in January the local sheriff's office was immediately notified and the Winona County Dive Team dispatched. Two bodies were quickly recovered from the vehicle, both wearing seatbelts, but two others were missing. The third victim was found the next day, but the fourth could not be located. Frigid water and limited visibility made a large scale search operation with divers nearly impossible. A decision was made to call in nearby Washington County Sheriff's Department and its underwater robot. Two years earlier the department had acquired JW Fishers SeaOtter-2 ROV which has two cameras, four thrusters and a SCAN-650 scanning sonar. The SCAN-650 allows the operator to see much further than the video camera because the sonar's sound wave sweeps a 200 ft. diameter circle around the ROV. The wave bounces off any object on the bottom and is sent topside where it produces an image of the object on a laptop computer. Using their ROV equipped with scanning sonar the Washington team was finally able to locate the fourth victim 125 ft. from where the vehicle entered the water and on the opposite side of the bridge. www.jwfishers.com

LiDAR Ordered for Wind Farm Development

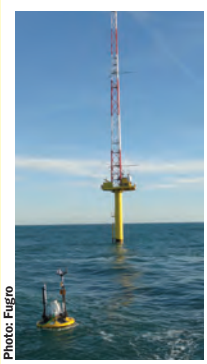


Photo: Fugro

Dutch energy company Eneco has purchased Fugro's new wind LiDAR buoy while a Japanese company is to deploy its buoy close to a floating power generation system. Fugro recently developed what it calls an accurate and cost-effective alternative to the traditional method of wind profile measurements for offshore wind farms. In January 2014 Fugro's SEAWATCH wind LiDAR buoy was deployed 75 km off the coast of Ijmuiden in The Netherlands where wind data will be compared with data from three levels on a met mast at the site, together with data from a LiDAR mounted on the mast. Wind data collected conventionally, using cup anemometers mounted on a wind mast is susceptible to distortion from the sensors and the mast itself - typically around 80m high. Fugro's SEAWATCH wind LiDAR buoy accurately measures the speed and direction of wind across the diameter of wind turbine rotors in profile up to heights of 300 meters.

www.oceanor.com

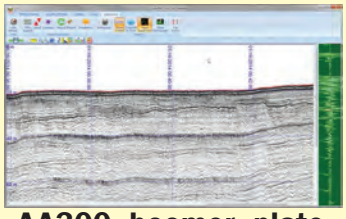
Photo: BIRNS

BIRNS Millennium Connectors

BIRNS, Inc. announced a range of new keying options for its BIRNS Millennium connector series. The BIRNS Millennium series is a six km rated, high density metal shell connector line trusted worldwide for demanding subsea applications, from manned and unmanned submersibles to sensors and towed arrays. The series is specifically engineered for challenging power and signal applications and systems requiring electro-opto-mechanical solutions. The new BIRNS Millennium series keys are fully machined and feature a new squared silhouette, providing increased strength and making the keying process more seamless, secure and user-friendly. BIRNS has also launched the position of an optional third key, providing purposeful incompatibility of different positions between the same connector with different circuits. This will obviate potential confusion in the field when more than one of the same connector—with the same pin configurations but different circuits, for example—are being used in a subsea system. The new third key option can be specified in one of four positions, which are designated by part number nomenclature.

www.birns.com

New Survey Interface



AA300 boomer plate, CSP-P capacitor bank, AH250/12 Hydrophone array, 250 joules at 3hz, Data courtesy David King, Marine & Earth Sciences Pty Ltd

Chesapeake Technology offers a new 24-bit analog sub-bottom SonarWiz interface (SBP24) for high resolution geophysical surveys. SBP24 provides extremely high resolution 24-bit data at sample rates from 10-100 kHz per channel for up to two channels over a standard USB 2.0 interface. Digitized data is stored in standard SEGY floating point format. The 24-bit data sampling provides greater dynamic range and the increased sampling rates allows for higher resolution of fine scaled sub-bottom reflectors.

CTI offers custom software and hardware solutions to the marine geophysical and seafloor mapping industry for over 20 years. Through its developments in marine surveying technology and solutions, CTI has become the standard for navies, government agencies, survey companies and universities around the world.

www.chesapeaketech.com

New Compact in situ pCO2 Sensor

Turner Designs now offers C-sense, a compact, lightweight pCO2 sensor for measuring the partial pressure of gas in liquids. Designed for applications involving immersion in water, oil, or water and oil mixtures, C-sense combines an oil-resistant membrane interface with a compact temperature-compensated nondispersive infrared (NDIR) detector.

Small (<2" x 8"; 5cm x 20.3cm) and lightweight (<1lb; 0.5 kg) with low power requirements (6-12V DC, 80mA at 6VDC) and a simple four-pin analog output, C-sense is designed to easily integrate with monitoring systems at a significantly lower price than traditional submersible pCO2 sensors. C-sense is offered in three range configurations – 1,000ppm, 2,000ppm or 4,000ppm with accuracies at 3% of full-scale and can be deployed to a depth of 600m.

C-sense was developed specifically for Turner Designs by Pro-Oceanus Systems Inc. in Nova Scotia, Canada. Pro-Oceanus has been providing the oceanographic research community with accurate submersible pCO2 sensors for more than eight years.

www.turnerdesigns.com

Sonardyne's Ranger 2 Pro will be installed on new build MPSVs, like the one modeled above, for complex underwater positioning and DP station keeping operations.

Sonardyne Ranger 2 Chosen for Russian Salvage Vessel

Sonardyne's Ranger 2 acoustic positioning technology has been selected by Transas for use on two new build ice-class multi-purpose salvage vessels (MPSVs, the project is developed by Marine Engineering Bureau) commissioned by the Russian Ministry of Transport. The vessels are currently under construction at Nordic Yards in Germany and will each be fitted with dual Ranger 2 Pro systems. In conventional Ultra-Short Base-Line (USBL) operating mode, Ranger 2 calculates the position of a subsea target, such an ROV or towfish, by measuring the range and bearing from a vessel-mounted transceiver to an acoustic transponder fitted to the target. By interfacing it to a dynamic positioning system, Ranger 2 can be used to simultaneously help maintain the vessel's own position. In Pro configuration, Ranger 2 adds support for Long and Ultra-Short BaseLine (LUSBL) acoustic positioning. The technique uses a network of transponders deployed on the seabed to offer precision and repeatability and is widely used for applications where maintaining a reliable vessel position is a critical operational requirement.

www.sonardyne.com

Engineered Syntactic Systems Expands High-Performance Buoyancy Offering

Engineered Syntactic Systems (ESS), a supplier of foam buoyancy solutions, announced plans to extend its line of syntactic products to support more traditional oceanographic implementations. The addition of modular product options enables ESS to supply more customers with great performance in a wider range of densities. The team at ESS has been serving the oceanographic industry for more than 30 years. As a supplier of flotation technologies for advanced customer applications, ESS combines engineering, design and manufacturing know-how to deliver the best depth performance in the business - from the surface to depths of 11,000m. ESS syntactics are lightweight, engineered foams designed to withstand significant hydrostatic pressure while delivering optimum performance.

"We are expanding our product offering to provide customers with a one-stop-shop for best-in-class buoyancy products," said Thomas Murray, managing partner at Engineered Syntactic Systems. "We recently discovered that there is a need for readily available, off-the-shelf products such as cable floats and Acoustic Doppler Current Profiler (ADCP) buoys. We are nimble enough to respond quickly and work closely with customers to provide cost-effective solutions that will address these needs."

www.esyntactic.com

Underwater Cutting Rod

Broco Underwater offers the new advanced design Broco Ultrathermic Cutting Rod PLUS. Based on a new patent-pending design, Broco said its new underwater cutting rod delivers 20% more cutting and burn time than the same size prior generation rod. According to the manufacturer, the new Broco Ultrathermic Cutting Rod PLUS increases burn time 20%, on average, for a 3/8" diameter by 18" long rod. Broco Underwater Ultrathermic Cutting Rod PLUS rods are currently available in 3/8" diameter by 18" length, and will be available in 3/8" diameter by 36" length later this year.

www.brocoinc.com

Shark Marine Launches D.A.S. Boat

Shark Marine Technologies introduced its newest system for autonomous bathymetric surveying: The DiveLog Automated Survey Boat or D.A.S. Boat. As its name suggests, D.A.S. Boat is controlled by Shark Marine's DiveLog software. Originally designed to create an intuitive interface for Shark Marine's Navigator product line, DiveLog is now being used for ROV Control, Diver Delivery System Control, Survey, and Search and Recovery Computer Topsides, as well as Autonomous Surface Vessel Control. DiveLog manages multiple positioning systems, route creation and following, and control of many different sensor types such as Side Scan, Multi Beam Profiling, Echo Sounders, Scanning Sonars, Magnetometers, Gradiometers and Cameras, and provides data collection and coverage mapping.

D.A.S. Boat can be operated manually using a hand controller, or be programmed to precisely follow routes created in DiveLog. While in Autonomous mode, DiveLog sends control information from a shore station using a radio modem. A small computer can also be installed in the D.A.S. Boat for operation without a shore station. Positioning and hydrographic data are sent from the D.A.S. Boat back to shore so its progress can be monitored. Data collected by D.A.S. Boat can be viewed in DiveLog and exported for processing in programs such as Hypack, Caris, and Fledermaus, or for use in Shark Marine's Sediment Accumulation Monitor (S.A.M.) Software.

www.sharkmarine.com

Photo: Kongsberg

Kongsberg Camera Systems for OOI

The Kongsberg Maritime Ltd. Camera group Systems & Projects Team delivered the first set of cabled IP Digital Still Camera Stations (CAMDS) to the University of Washington. The delivery is for the regional cabled observatory component of the Ocean Observatories Initiative (OOI) program in the northeast Pacific Ocean off the West Coast of the United States of America. Further cabled systems are scheduled for delivery in the coming months to Oregon State University as part of the coastal Endurance Array component of the OOI program. The OOI is funded by the U.S. National Science Foundation.

Designed for real-time imaging via the cabled observatory's Internet connection, the regional CAMDS systems will be deployed as part of the OOI at methane seep and hydrothermal vent sites deep in the ocean where they will remain for one year. They will capture images of the evolving vents and the bacterial and animal life that grows around them. The coastal Endurance CAMDS systems will be deployed on the seafloor in cabled benthic packages on the continental slope and shelf off the coast of Oregon, to image the sediment surface in sufficient detail to identify swimming and crawling organisms, observe changes in physical bedforms, and detect tracks and trails made by mobile fauna. The system can be controlled over Ethernet and is capable of live streaming images as well as storing them locally on board the camera or over network drives.

www.km.kongsberg.com

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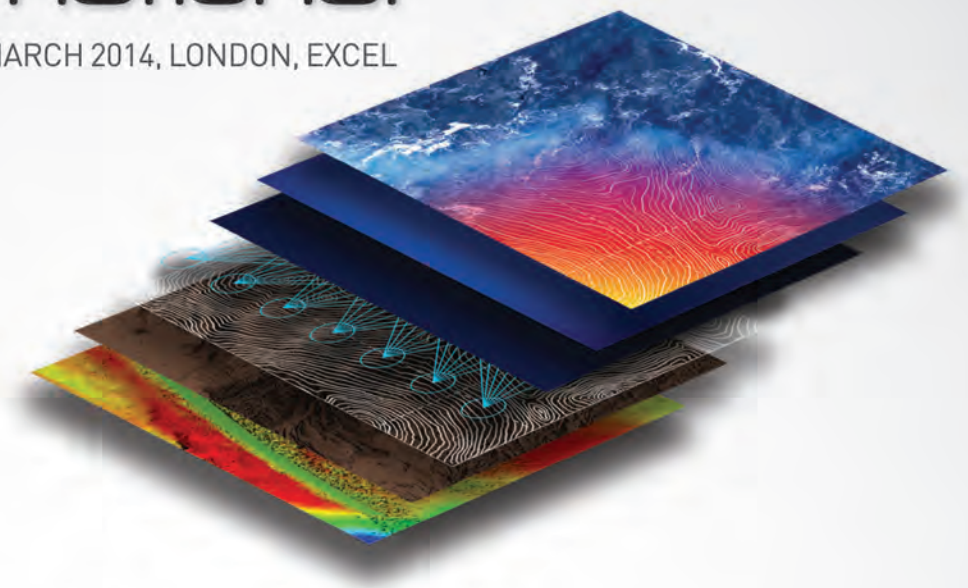

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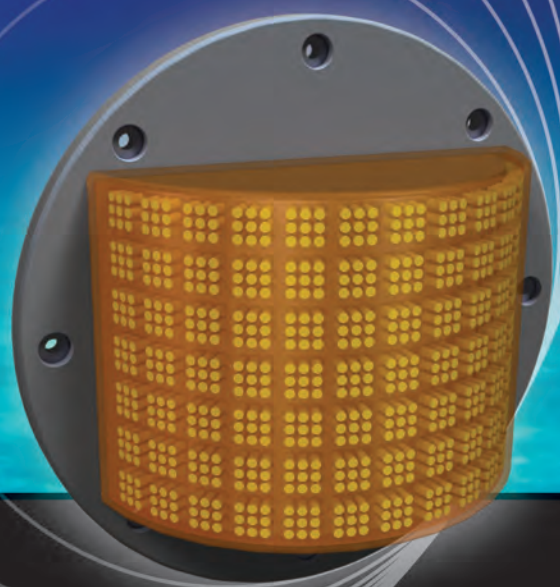

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