SCIENTIST-IN-THE-SEA: PAST, PRESENT, AND FUTURE TRAINING OPPORTUNITIES FOR DIVING SCIENTISTS

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ABSTRACT
Dr. George Bond and faculty from the Florida State University System developed a multidisciplined, full-time, summer-long, graduate credit program that exposed students to the underwater life-support and data collecting technology available at that time. George called it Scientist-In-The-Sea (SITS) after the US Navy's Man-in-the-Sea Program and staffed it with Navy, industry, and university diving experts. The first course was offered in 1970. By 1976, sixty students from around the country had completed the program across five summers. Students were expected to bring their discipline to the course and evaluate the technology presented for applicability to their individual research objectives. Students were expected to conduct up to three projects (depending upon the year), using newly acquired skills and technology. Research vessels, habitat (saturation), production platform, SCUBA (open circuit, rebreathers) and hose, several mixed-gases, photo/video, sonar, u/w comms, remote sensing, and much more were included in the training opportunities offered (depending upon the year). Students attended morning lectures, afternoon pool and field practicals, and evening seminars six days a week. SITS was subsequently not offered for 23 years.

Over the years, many SITS graduates kept in touch, expressing a desire to continue the SITS Program. Since 1976, Florida State University (FSU) has built a campus near the navy base and last year began to expand their course offerings. The base and diving scientists in this area requested the return of the SITS Program. An all-new diving support program dedicated to advanced diving technology was created by the FSU Vice President for Research at FSU and installed under the Dean at the Panama City Campus. Last year the SITS Program was offered again on the USN Coastal System Station in Panama City by Florida State University under the direction of SITS graduates now in leadership positions. This paper will describe the SITS Program design in detail. The Program will be offered again next summer as an in-residence (on the base), regional, 12-graduate-credit field school. Proposed curriculum, schedule, and application details are available on the web page at http://www.SITS.fsu.edu.

INTRODUCTION
Saturation diving was established as a powerful tool for people who needed to remain underwater for extended periods of time. Project Genesis and the Sea Lab habitats of the '60s set the foundation for men living in the sea. Others followed. Folks responsible for the early Navy effort were located in Panama City and working on an Ocean Simulation Facility as the US Navy moved beyond residential habitats to portable bell/saturation systems. The date was 1970.

Their leader and the father of saturation diving, Captain George Bond, MD, recognized that much of the technology developed for mission-oriented Navy diving had civilian application. Working with fellow Sea Lab Aquanaut Bob Barth and later Wilbur Eaton, scientists at the base, and faculty from several Florida universities, Dr. Bond proposed a college course to transfer this experience to civilian graduate students exposing them to underwater life-support and data-collecting technology used by Navy divers. For ten weeks, students would attend lectures, pool practicals, and field exercises by Navy, industry, and science personnel on topics ranging from in-water sonar, rebreathers, chambers, exposure suits, underwater cameras, sleds, and so much more to, of course, saturation diving. Interspersed were more traditional academic lectures on physics and physiology, research methodology, project management, and more.

Students were required mid-course to propose and implement projects they would complete during a one-week field exercise using technology and techniques recently mastered. This procedure would be repeated during a final multiple-week project at summer's end, either aboard a research vessel or saturated in a habitat. Surviving the rigorous training was not enough. Grades for the 12 credits were based upon papers required for all projects. The first SITS course in 1970 was described as opportunistic and chaotic. Better funding encouraged an improved second course two years later. By 1973, with Sea Grant funding and NOAA support for the use of a habitat, SITS was growing fast (Green and Eaton 1973).

SITS candidates were primarily graduate students. They were selected first by their major professor and then by a Steering Committee. Preference was given to those students who had demonstrated diving and academic
ability because SITS was not a “learn to dive” course. Perhaps more important were the “need to know” requirements based upon a short essay candidates submitted with their application and letters of recommendation. Once selected, candidates had to pass a medical evaluation as strict as any AAUS test of today. Finally, students were subjected to the test of pressure and oxygen tolerance in a chamber. Candidates ranged from recently certified to instructor in diving, advanced senior to PhD and MD, science and engineer majors, civilian and academy students, male and female alike. While files are sketchy from back then, a list of SITS graduates and their affiliated university is appended.

All SITS courses were held in Panama City at the Naval Coastal Systems Station with one exception. Ten graduate students first attended the course in 1970. The course was refined over the next six years before losing its momentum. By late 1976, sixty students had taken the course—nearly seventy if you count the students that served as staff that supported the courses. Today they occupy positions of leadership in our community. Every year up to 50 guest speakers participate in the summer-long curriculum. By 1974, SITS was funded by grants from the Man Undersea Science and Technology (MUST) office of the National Oceanic and Atmospheric Administration (NOAA) and Florida Sea Grant. The (Florida) State University System Institute of Oceanography (SUSIO) administered the program, collaborating with the Naval Coastal Systems Station (NCSC) for course residency and securing credit from the University of West Florida. After a failed attempt to offer the course in 1975, FSU offered the course at its Marine Lab at Turkey Point. Students were driven to the NCSC, or NCSC staff came to FSU often that summer, continuing the SITS tradition of University/USN collaboration.

Teaching the SITS program was a monumental endeavor for key people. Mr. Chris Combs (SITS I) was instrumental in required behind-the-scenes logistics of each program until 1976. USN Aquanaut Wilbur Eaton became the Field Director for SITS II, III, and IV with considerable assistance to SITS V. Dr. Bob Smith, Director of SUSIO, along with many Academic Directors and Steering Committee members, pressed for curriculum and funding throughout the years. The supporting faculty grew to a list of over 50 participants by the time SITS ran out of steam in 1976. The SITS staff are very dedicated people.

THE SITS MODEL
George Bond and his staff taught from a simple model. Each morning began with PT (calisthenics, jogging or swimming). After showers and with everyone assembled in lecture, he would introduce a topic and discuss the application of a technology or technique to a research project in great detail. Often, he and others would note the multidisciplinary opportunities a tool might have in science. In the afternoon, his staff would take students into the laboratory to dry-dive the technology until students were comfortable with its peculiarities. The next day students were taken out to the docks or pool for wet dives, depending upon the nature of the technology (and weather). Finally, selected technology was made available for student projects. The model worked.

Students were expected to bring their discipline to the class, as SITS was not designed to make them scientists, only to make them more capable data collectors underwater. Certification was NOT the objective of this training, but rather familiarization with a wide range of new opportunities presented by a technology. Should a student need certification, post-SITS opportunities would be found. Teachers came from the US Navy, regional universities, the diving industry, and other federal and state labs. Using this model, SITS students were expected to assimilate techniques and technology that best suited their line of research.

Interspersed, and often in the evening, Dr. Bond would lecture on a diverse range of topics in diving medicine, history, physics and physiology, dive procedures, and project management. He spoke of the many things we thought our community had mastered and, more often, that which it had not. He brought other leaders in this field to also lecture on a wealth of knowledge and experience found in few other academic courses. They spoke of experiences first-hand as they saw history made. Interaction with guest speakers provided outstanding networking opportunities for post-SITS contacts.

Of course, the military way of conducting underwater projects was not quite like that followed in the civilian world. It is true that both are mission oriented. Students were asked to shave off beards, wear a form of uniform, march in rank, serve as stand-by divers, and perform early morning physical training (PT). Many chafed under these requirements until they realized the class of 10–20 students (many considered at first somewhat weak as divers) were safely performing tasks using advanced technology well beyond expectations. By the time they saturated in the HydroLab in 1973 and 1974, the SITS class represented a very capable team that performed surface-support, project management and data collections that produced publishable papers.

REBIRTH OF SITS
George Bond and Wilbur Eaton have passed away. George left the entire SITS files documenting meetings, applicants, speakers and all to me for future use. Many of us SITS graduates have kept in touch over the years as we progressed through our respective careers. Since 1976, I had worked closely with Navy base contacts to develop the Academic Diving Program at FSU. The ADP was born out of the ashes of SITS, its inventory transferred to establish the ADP’s first dive locker.
After 25 years of growth, ADP had much to offer back to a SITS Program. In 1999, I was asked to investigate training opportunities now that FSU has a new campus adjacent to the Navy base in the Panama City. What I found was a very willing community with much of the same resources and commitment that embodied the SITS program of the 1970s. After a year of discussions, I accepted a promotion and transferred to the Panama City Campus to direct a program dedicated to serving a regional requirement for advanced training and support in science diving technology. Our first objective was to teach the SITS program during the summer of 2000.

SITS 2000 was directed by SITS graduates now secured in their respective careers. The SITS Steering Committee was (and still is) made up of representatives from all of the past SITS programs. Dr. Claude Harvey (USN RET), the Diving Officer who replaced Dr. Bond at the Navy base, became our mentor, lecturing to the students much like George did in the '70s. Dr. John Clarke (SITS II) became the Academic Advisor, Dr John Camperman (SITS V) became the Technical Advisor, and I (SITS IV) took on the directorship as I had done in 1976. Terry Johnson (SITS II) and Bill Charlston (TAMU) became much more than just teaching assistants, while Steve Matthews (USN RET) managed our new Dive Locker.

A gas-blending station was established at the National Marine Fisheries Laboratory (NMFS) a few miles down the bay from the FSU campus. Students were housed on base at the BEQ and hosted at the Naval Diving and Salvage Training Center (NDSTC). With the assistance of several deans at FSU, several USN officers at the CSS base, and a strong community support (35 guest speakers), we pulled a six-week intense SITS program safely and successfully through to a saturation mission in the Florida Keys with only three months of preparations. Dr. Bond would have been proud.

THE SITS 2000 AGENDA

- Expose graduate students from science disciplines to state-of-the-art underwater research and life-support technology
- Teach safe management practices for underwater research projects (risk management of mission-oriented diving activities)
- Teach grantsmanship from the formation of an idea through the final proposal
- Provide opportunity for students to conduct underwater research of their own design while using advanced data and life-support technology with safe management practices.

TEXTBOOKS INCLUDED

Latest US Navy Diving Manual (now includes Nitrox) Introduction to Scientific Diving by John Heine Papa Topside by George Bond

NSS Cave Diving Manual—An Overview by Joe Prosser and H. V. Grey
Gas blending manual (IANTD manual)
Scientific Diving, A General Code of Practice by Nic Flemming

THE SITS CURRICULUM

Week 1: start-up, course format, history of diving, basic SCUBA equipment: skills, repair and maintenance, advanced diving physiology, psychology, and medicine (and hyperbarics), literature search and concept papers due, mission and safety management, grantsmanship
Week 2: Diving disciplines (Biology, Anthropology, Physiology, Geology), surface-supply technology and skills, remote sensing, underwater photo/video, funding research, proposals due
Week 3: mixed-gas diving in science, oxygen safety and blending gases, cryogenic SCUBA, thermal considerations, overhead environments, grantsmanship, platform cruise plan due
Week 4: rebreather technology and skill (oxylung, semi-closed, and electronic fully closed), managing the grant, final platform cruise plans due
Week 5: field research, student projects by teams in the field for one week (saturation in Florida Keys)
Week 6: OMADS/ROV/AUV and other future diving technology, cruise reports, papers and presentations

THE SITS PREREQUISITES

- Graduate student status or advanced senior level
- Register for full SITS course load (no audit)
- Demonstrated strong interest in underwater research
- Qualified Restricted Science Diver (AAUS Standards for Scientific Diving) and physically fit (this means a full medical evaluation that must be approved by our physician)
- Divers insurance (DAN or equivalent health policy)
- Six-week commitment to residence in the Panama City area (no part-timers)

Course Credit Load: 6 Graduate Credits for six weeks. The cost of in-state graduate tuition was $876.06 for the six credits. Out-of-state tuition was $3040 for the six credits. Students stayed at the BEQ and were fed at the General Mess for a prearranged rate. Students worked out on exercise machines and were monitored by a personal trainer. They met for lectures at the NDSTC, NMFS, and FSU-PC campuses.

Grades were based upon academic performance and program participation in an equal proportion. Papers were collected at prescribed times and graded. A student presentation at the end of the course was expected. The Academic Director coordinated saturation project topic selection. Throughout the course the student was expected to provide a concept paper, pre-proposal, cruise plan for a pilot project, pilot project report, and full proposal.
THE FUTURE
SITS VII will be offered in the summer of 2001, reconfigured back to the original 10-week schedule. A web page at http://www. SITS.fsu.edu has been established to provide information on the course, application forms, history, etc. As of this printing, we have applicants from the southern states and one from Germany. The Steering Committee will expand enrollment beyond 10, but a final figure has not been set.

Panama City has become a regional focus for advanced compressed-gas diving. FSU at Panama City has established a facility in collaboration with industry and federal agencies to provide training. Training courses in advanced science diving technology (Surface-Supplied, Overhead Environment, Rebreather, Deep Mixed-gas) are configured to provide certification to a regional science-diving interest. They are scheduled in week-long modules and offered during the Fall and Spring semesters.

CONCLUSION
It is important to emphasize the uniqueness of the Scientist-In-The-Sea Program model. SITS does not create scientists. It is both an academic and technical training opportunity where students apply their discipline to currently available technology and techniques, enabling them to more efficiently function as diving scientists. Students who are highly motivated towards a professional career in marine-oriented science should consider spending a summer attending this multi-agency/industry/disciplinary graduate program.

REFERENCES
Green, George C., and Wilbur Eaton. (No date) Scientist-In-The-Sea, a report found in the SITS files of the late Captain George Bond. 10 p.

SCIENTIST-IN-THE-SEA GRADUATES

SITS I (October 1970)
Ann Eidemiller Rudloe (Biology FSU)
Chris Combs (Biology FSU)
Andrew Auld (Biology UWF)
Kyle Barrinaeu (Biology UWF)
John Bedingfield (O Engineer UF)
John Dryer (Biology USF)
John Gelder (UF)
Larry Ogren (NMFS Panama City)
Melissa Wigfall (Biology UWF)
Sam Williams (Oceanography FSU)

SITS II (Summer 1972)
Ramone Baccus
John Clarke (Biology FSU)
Mike Czarnecoki (O Engineer FAU)
Tom Iliffe (Oceanography FSU)
Roxana Rohrick
Joe Halusky (Biology FSU)
James Doran
John Gifford (Geology UM)
Nancy Goldstein
Robert Hastings
Terry Johnson (O Engineer FAU)
Susan Karl
Mark Lawrence
Michael Mabry
Jack McDonald
William Swartz

SITS III (Summer 1973)
John Halas
Rob Mattlin (New Zealand)
Charles BiggerS (Biology FSU)
Gregory Francis (Bioengineering)
J. Frank Wahttenbarger
Robin Morehouse (Canadian)

SITS IV (Summer 1974)
Gregg Stanton (Biology FSU)
Edward Conklin (Biology FSU)
Susan Cooley (BiologUF)
Arnold Staller (Chemistry U Hawaii)
Robert O'Brien (Anesthesiology MD USN)
Mike Muihead (O Engineer FAU)
Dennis Hubbard (Geology US Carolina)
Carroll Bernier (BiologUF)
Joe Russell (Exercise Physiology SRSC)
Lewis Bullock (Biology US Miss)
Ian Workman (BiologUF)
James Hicks (E Engineer UF)
Barbara Carr (BiologUF)
Albert Walton (BiologFSU)
Douglas Rao (O Engineer USN Academy)
Dean Vidal (O Engineer USN Academy)
James Brooks (Oceanography USN Academy)
Chris Smith (BiologUF)
Andre LaBonte (Marine Tech Miami Dade)

SITS V (Summer 1976)
John Camperman (O Engineer FAU)
JP Schmall (BiologFSU)

SITS VI (Summer 2000)
James McClean (Anthropology FSU)
Jason Raupp (Anthropology FSU)
Glen Forest (Anthropology ECU)
Sharyn Nasca (Psychology FSU)
Dan Wideman (Communications FSU)
Buck Lawhorn (Criminology FSU)
Eric Swanson (Geology FSU)
Bill Charlton (Anthropology TAMU)

Mike Hill (BiologFSU)
Trisha Logan (Anthropology FSU)
Terry Muller (BiologUSF)
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Ann Stanton (Anthropology U Hawaii) staff
Lisa Shuey (Classics FSU) staff

SITS VII (Summer 2001)
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Buck Lawhorn (Criminology FSU)
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