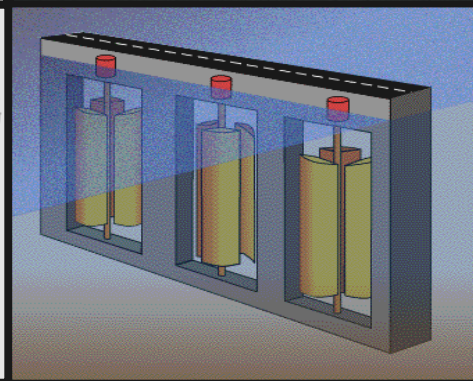
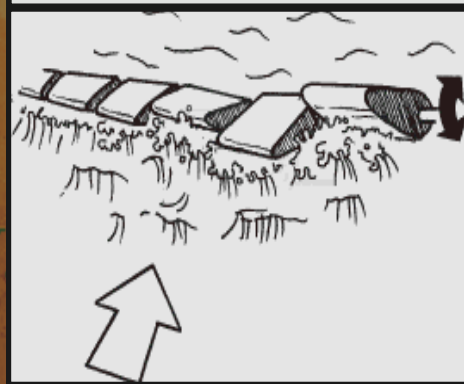
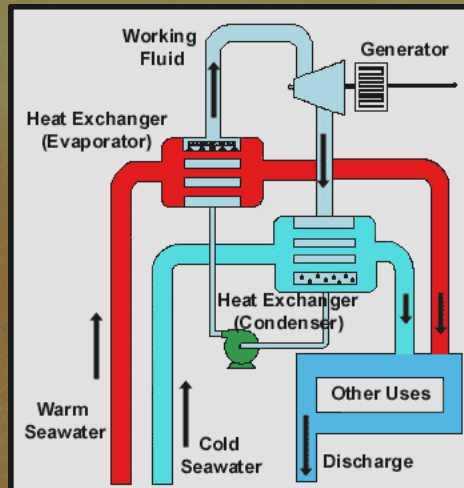


Center of Excellence in Ocean Energy Technology

Technical Proposal



1. SUMMARY INFORMATION

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Title of Proposal:

The Center of Excellence in Ocean Energy Technology

Abstract:

The Center of Excellence in Ocean Energy Technology (COEOET) will be a synergistic partnership among academia, industry, and state and federal agencies that will foster the research, design, development, implementation, testing, and commercialization of cutting-edge ocean energy technology that is cost-competitive with existing fossil-fuel-based power generation.

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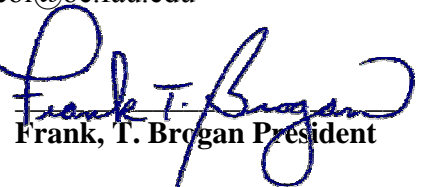
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Frank, T. Brogan President

Original Date of submission: September 15, 2006

Period of Performance (base effort and option(s)): 2 years; FY07 – FY09

Total Cost (base effort and option(s)): \$10,000,000

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3. Executive Summary

Crosswalk

Factor No.	Success Factor Description	Page Ref.
1.	Maturity of existing programs relating to a proposed center of excellence.	9, 10, 13, 14, 16-18, 21, 22, 25
2.	Existing amount of resources dedicated to activities relating to a proposed Center of Excellence.	5, 17, 18, 22, 24, 25
3.	Comprehensiveness and effectiveness of site plans relating to a proposed Center of Excellence.	3-5, 8-10, 18,21-25
4.	Regional economic structure and climate.	18-20
5.	The degree to which an applicant proposed to house a Center of Excellence identifies and seizes opportunities to collaborate with other public or private entities for research purposes.	2-4, 6, 9, 16-18, 20-22
6.	The presence of a comprehensive performance and accountability measurement system.	5, 10
7.	The use of an integrated research and development strategy utilizing multiple levels of the educational system.	8, 12-16, 24-25
8.	The ability of an applicant proposed to house a Center of Excellence to raise research funds and leverage public and private investment dollars to support advanced and emerging technological research and development projects.	4, 9, 16, 17 22, 23
9.	The degree to which an applicant proposed to house a Center of Excellence transfers advanced and emerging technologies from its laboratories to the commercial sector.	4, 5, 8-10
10.	The degree to which an applicant proposed to house a Center of Excellence stimulates and supports new venture creation.	8-10, 20, 21
11.	The existence of a plan to enhance academic curricula by improving communication between academia and industry.	3, 5, 23-25
12.	The existence of a plan to increase the number, quality, and retention rate of faculty, graduate students, and eminent scholars in advanced and emerging technology-based disciplines.	18, 23-25
13.	The existence of a plan to increase the likelihood of faculty, graduate students, and eminent scholars pursuing private-sector careers in the state.	24-25
14.	Ability to provide capital facilities necessary to support research and development.	13, 14, 16-18, 22

Proposed Center

Florida is the nation's fourth most populous state and ranks third nationally in total energy consumption. Florida's economy and the quality of life of its more than 17 million residents are dependent on a sufficient, affordable, secure, and reliable supply of energy, now and in the future. As one of the fastest growing states, Florida's electricity consumption is estimated to increase by nearly 30% over the next 10 years with a corresponding 16% increase in fuel consumption. In-state energy production is less than 1% of consumption; that is, Florida is heavily reliant on imported sources of energy. Natural gas, coal and other fossil fuels compose more than 85% of Florida's electricity-generating capacity; less than 10% is nuclear power, and very limited cost effective in-state renewable sources of energy are commercially viable (to date, solar technology has remained largely inefficient and expensive). Thus, alternative next-generation technologies that are stable and secure and meet present and future demands are needed to provide Florida-based generation capability.

The proposed Center of Excellence in Ocean Energy Technology (COEOET) will be a synergistic partnership among academia, industry, and government laboratories. Utilizing its combined ocean engineering expertise, extensive fabrication and testing expertise, and the large South Florida Testing Facility range, COEOET will foster the research, design, development, implementation, testing, and commercialization of cutting-edge ocean energy technologies that are cost-competitive with existing fossil-fuel-based power generation; ocean current, wave, tidal, and thermal gradient based power will be considered. Working closely with COEOET's industrial partners, promising next generation technologies will be investigated, refined, fabricated, and tested to identify viable systems, with well understood and mitigated environmental impacts, capable of meeting the energy demands of Florida. These novel systems will then transition and lead to the establishment of a new renewable ocean energy industry with profound local, national, and international impacts. The new industry will provide a clean, reliable, and renewable source of energy that can be used to generate electricity, unlimited hydrogen and potable water, as well as to provide alternative methods for residential cooling. Transition efforts will include the development of a base infrastructure to support ocean energy system research, development, and testing. The capabilities of the COEOET will complement the capabilities of the National Renewable Energy Lab and lead to a strong partnership focused on Ocean Renewable Energy. Through competitive solicitations, proposals will be sought and, reviewed, and the most commercially promising ideas will be funded to develop commercial systems. Finally, the existing Ocean Engineering academic program at Florida Atlantic University (FAU) will be leveraged to develop an Ocean Energy option to educate and train the necessary workforce to support the industry.

The Center of Excellence in Ocean Energy Technology will provide a large step toward achieving some of the recommendations of the Florida Energy plan: promote fuel diversity, fuel supply reliability and energy security, and expand solar, hydrogen, biomass, wind, ocean current and other emerging technologies. This will be accomplished through 1) research and development of efficient cost-effective technology and systems for harnessing all forms of ocean energy leading to their fabrication, demonstration, and commercialization; 2) design of optimal systems and technology for cold water-based cooling systems, their development, demonstration, and commercialization; 3) implementation of a prototype ocean power plant and cooling system at FAU's SeaTech Campus to assess its effectiveness, make improvements, and provide

projections of impact of commercial systems, like the system established at the University of Hawaii; 4) assessment and mitigation of any environmental impact of implementing ocean energy harnessing systems in Florida waters, 5) establishment of local seed industry in ocean energy; and 6) development of hydrogen and potable water generation technologies driven by clean potential and kinetic ocean energy.

Industrial Need and Outcome

The Center will be the impetus of a new industry that has the potential to change the economic and social environment of Florida, the U.S., and indeed, the world. As the world's economy grows and strives to meet growing energy demands, new sources of energy are being sought. The ocean is capable of meeting all of the world's present and future energy needs, but new and innovative technologies are needed to harness the ocean's power. The COEOET will provide that base to develop and apply the prerequisite environmental-friendly technologies in a unique energy dense location that is capable of large scale development. The seed industry established through the COEOET will refine ocean energy technologies and develop a technology and industrial base that will initially focus on harnessing ocean energy in Florida and then export energy products to worldwide locations. Harnessing ocean energy in Florida will provide a degree of energy independence for Florida through sustainable and reliable renewable clean energy. It will also create a new economic sector and associate industries with potential for tens of thousands of jobs and billions of dollars of revenue. The COEOET will establish Florida as the clear leader in key emerging technologies for harnessing ocean energy with a potential to dwarf the world's oil and coal sectors. With limitless international development potential, the COEOET may profoundly change Florida's economy and generate a sector with hundreds of thousands of jobs around the world, many based in Florida. Resulting annual revenue potential is estimated to be in the hundreds of billions to trillions of dollars.

University Capabilities

The Center will enhance the academic capabilities of FAU and its sister institutions in several ways:

Opportunities for Scholars

The Center will invite scholars and industry experts from around the world to participate in basic and applied research and development of innovative technologies in all forms of ocean energy. New joint academia-industry education and training programs in ocean energy will be developed. World-class educational programs in ocean science and engineering will be established, building on existing programs and utilizing talents of visiting scientists and engineers.

Collaboration

The Center will be a hub for collaboration among academia, industry, and state and federal agencies. Workshops will be held to determine technology gaps in ocean energy and identify critical areas for research and development and nationwide and worldwide research collaborators. Members will be drawn from academia and industry into all aspects of the Center, from basic research and education to workforce and product development. The Center will draw its expertise from research institutions such as Florida Atlantic University (FAU), University of Central Florida (UCF), Harbor Branch Oceanographic Institution, Nova Southeastern University Oceanographic Center (NSU OC), Virginia Tech, University of California at Berkeley, University of Miami, Florida State University, University of Florida, University of Hawaii, from

industry such as Florida Power and Light, Ocean Renewable Power Company, Aquantis, Oceaneering International Inc., Ocean Power Technology, and Lockheed Martin, and from state and federal agencies such as Florida Department of Environmental Protection, U.S. Department of Energy, National Renewable Energy Laboratory, NOAA, and Office of Naval Research. Economic development support for the COEOET will come from organizations such as the Marine Industries Association of South Florida and the Business Development Boards of Palm Beach and Broward Counties. This team effort will establish the first nucleus of core capabilities in Florida to propel the discovery, development, and commercialization of new technologies for harnessing all forms of ocean energy as well as generation and distribution of power and clean hydrogen. Many collaborations and programs are in place, and others will be created as a result of the formation of this Center.

Transferring Commercially Promising Technology

The process of accelerating technology transfer and downstream commercialization requires a collaborative effort between members of the legal and accounting professions, as well as early stage angel- and venture-capital investors. South Florida has a world-class infrastructure in place that includes hundreds of professional service providers who are experts in patent-related issues, technology transfer, licensing and commercialization. It includes experienced attorneys, accountants, and consultants, as well as investment firms and five angel networks. The approach to base the Center on academia/industry/state and federal agency partnership will serve as a platform for the development and implementation of new and innovative systems and processes to improve technology transfer. The FAU Office of Technology Transfer will take the lead in working with all Center partners to establish an industry/economic development centric transfer initiative that will be transferable to other industries, markets and institutions.

Plan for Self-Sufficiency

The Center of Excellence in Ocean Energy Technology's strengths include world leaders in the ocean engineering and renewable energy technologies, research infrastructure, facilities, and location. Most unique is the location of the proposed center at FAU's SeaTech facility in Dania Beach and its existing South Florida Ocean Measurement Center (SFOMC) partnership and infrastructure with the U.S. Navy, NSU OC, and others. Not only is this location within a major energy market and near a grid entry point, but it is the location where the Gulf Stream is the closest to shore and one of the only locations where there exists a large thermal gradient with deep cold water close to shore. The COEOET will leverage its assets to develop economic and sustainable ocean energy harvesting technology that will be transitioned into a seed industry, which will be the first ocean energy sector capable of continual energy production. The non-recurring initial seed money provided by the state for the COEOET will be sufficient to establish a self-sustaining base. Multiple efforts are planned to generate funds that will build and sustain the COEOET that leverage off the base capabilities, including the generation of royalty streams through licensed technology, private and government funded technology development, federal earmark requests, education and workforce development, direct funding through U.S. Department of Energy renewable energy program, participation in the Florida Renewable Energy Technologies Grant Program, a Center Sponsorship Program, and through use of the instrumented offshore range. The total revenue stream to the COEOET is estimated to be over ten million per year within the first 10 years with unlimited potential as the ocean energy sector grows.

Organizational Plan

Research Plan Philosophy

The Center's philosophy in creating the research program is to build on existing strengths and create a unique energy niche that will serve Florida, the nation, and the world. This will be achieved through the integration of ocean engineering, renewable energy engineering, environmental science, and marine biology. Importantly, the Center's research program views commercialization as the driving force for all activities and therefore will utilize and integrate the expertise and experience of industry leaders in all aspects of the Center.

Organizational Structure

The Center will have a well-designed organizational structure with management personnel in key positions and advisory committees positioned to guide and monitor the activities of the Center.

Principal Offeror, Dr. Larry F. Lemanski, FAU V.P. for Research, will ensure the Center executes its vision.

Board of Directors composed of five to seven industry, academic, naval, and government leaders that will be selected by the Principal Offeror as advisors.

Program Manager, Camille E. Coley, J.D., FAU Executive Assistant Vice President for Research will be the Center coordinator, budget manager, and point of contact for the emerging industry.

Technology Commission

Principal Technical Personnel, Dr. Manhar R. Dhanak, FAU Professor and Chair of Ocean Engineering and Dr. Frederick R. Driscoll, FAU Associate Professor of Ocean Engineering, will direct the scientific and workforce programs of the Center and direct the activities of the Ocean Renewable Engineering Group. These groups will be composed of academic and industry scientists from all of the participants in the Center.

Research Advisory Committee, chaired by Dr. Manhar R Dhanak, Professor and Chair of Ocean Engineering at FAU, will be composed of representatives from academia, industry, navy, and government agencies and will serve as advisors to the Principal Technical Person and monitor the implementation and execution of the research and workforce programs.

Principal Business Personnel, Dr. Gerald N. Goldberger, FAU Assistant Vice President and Director of Sponsored Research, will manage the awarding of funding, subcontracting, contract negotiations, performance and accountability measurement systems, and technology transfer activities.

Financial Advisory Committee, will be an ad-hoc committee composed of representatives from academia and industry and will serve as advisors to the Principal Business Person and monitor contract and financial activities.

Technology Transfer Advisory Committee, chaired by Steven Nappi, Interim Director and Assistant Vice President for Research, FAU Office of Technology Transfer, will be composed of representatives from academia and industry and will serve as advisors to the Principal Business Person on all technology transfer and commercialization matters and monitor the processes and procedures.

4. Technical Proposal

4.1 Vision

Relevance to the future Florida's economy

Florida is facing an energy crisis in terms of supply, cost, capacity, and environmental impact. Within the next 10 years, Florida's energy demand is expected to rise 30% from 242,524 Gigawatt-hours to 312,800 Gigawatt-hours. Currently, 86% of the electricity generating capacity is hydrocarbon based and is composed of 39% natural gas, 24% oil, and 23% coal. Future generating capacity is predicted to be composed of 80% natural gas, 19% coal, and 1% oil. This reliance on fossil fuels, which are purchased both nationally and internationally, leaves Florida vulnerable to supply interruptions (caused by storms, international supply, political turmoil, etc.) and increased costs. Prices for oil and natural gas have risen at near exponential rates, and these price increases are predicted to continue. Fuel costs are passed directly to the consumer, slowing economic growth and binding Florida's future directly to the rapidly increasing costs of fuel. Moreover, in local markets, such as in South Florida, demand is quickly outpacing capacity. Without additional generation facilities, demand is expected to exceed peak generating capacity in 2007. To overcome Florida's shortfall in capacity, 2,500 Megawatts of interface capacity are reserved from out-of-state facilities. However, this leaves local markets vulnerable to supply interruption due to facilities shut down for maintenance or other reasons.

While both nuclear and land-based renewable sources of energy are attractive alternative to meet future demand and create an in-state energy source that is stable in price and supply, neither will fully meet future needs. As a renewable power source, the potential for ocean energy is far more significant. Although both tidal and wave energy hold some promise in Florida, ocean current and thermal energies offer the most reliable energy solutions that can meet future energy demands within the state. Harnessing ocean thermal energy also offers an added benefit of providing cold water for air-conditioning systems, thereby reducing electricity consumption. Furthermore, ocean energies can provide efficient and clean methods of generating hydrogen and methods for producing desalinated drinking water. Not only could the ocean provide a significant in-state power source that is not subject to price fluctuations or supply disruptions, but it can help solve many environmental problems presently plaguing Florida. For example, the potable water generation could help reduce the volume of water extracted from the everglades, reduce the temperature of the thermal effluent of near shore power plants, and stabilize the brackish and salt water estuaries currently being inundated with fresh water. The COEOET will leverage Florida's unique location and expertise to develop and refine technology that will be exported to locations throughout the world, and it will thus provide a base to propel Florida and the nation into the leading renewable energy producer.

Scientific and Commercialization Vision

The COEOET will be a synergistic partnership among academic, industry, navy, and government experts from Florida Atlantic University, University of Central Florida, University of Florida, Nova Southeastern University, Harbor Branch Oceanographic Institute, Federal Department of Energy, the National Renewable Energy Labs, the Naval Surface Warfare Center Carderock Division, the South Florida Testing Facility, the U.S. Navy, Florida Power and Light, Clipper Windpower, Aquantis LLC, Ocean Renewable Power Company, Ocean Power Technologies, and other power companies. The Center will foster the research, design, development, implementation, testing, and commercialization of cutting-edge ocean energy technology that is cost competitive with existing fossil fuel-based power generation. Environmental effects and

impacts are critical to any energy generating methodology and particularly important to be understood in an ocean environment. These will be well studied and evaluated. Mitigation measures will be developed. Through the Academia/Industry/Government Partnership, the center will lead to the establishment of a new renewable ocean energy industry in Florida with a core set of capabilities that will provide a base industry framework and enable future growth. The new industry will provide a clean, reliable, and renewable source of energy for the generation of electricity and unlimited hydrogen and potable water, as well as, provide alternative methods for residential cooling. Leveraging the combined expertise within the COEOET and its unique location, the COEOET with its new ocean renewable industry partners will become a world center for ocean energy technology and industry with profound local, national, and international impacts.

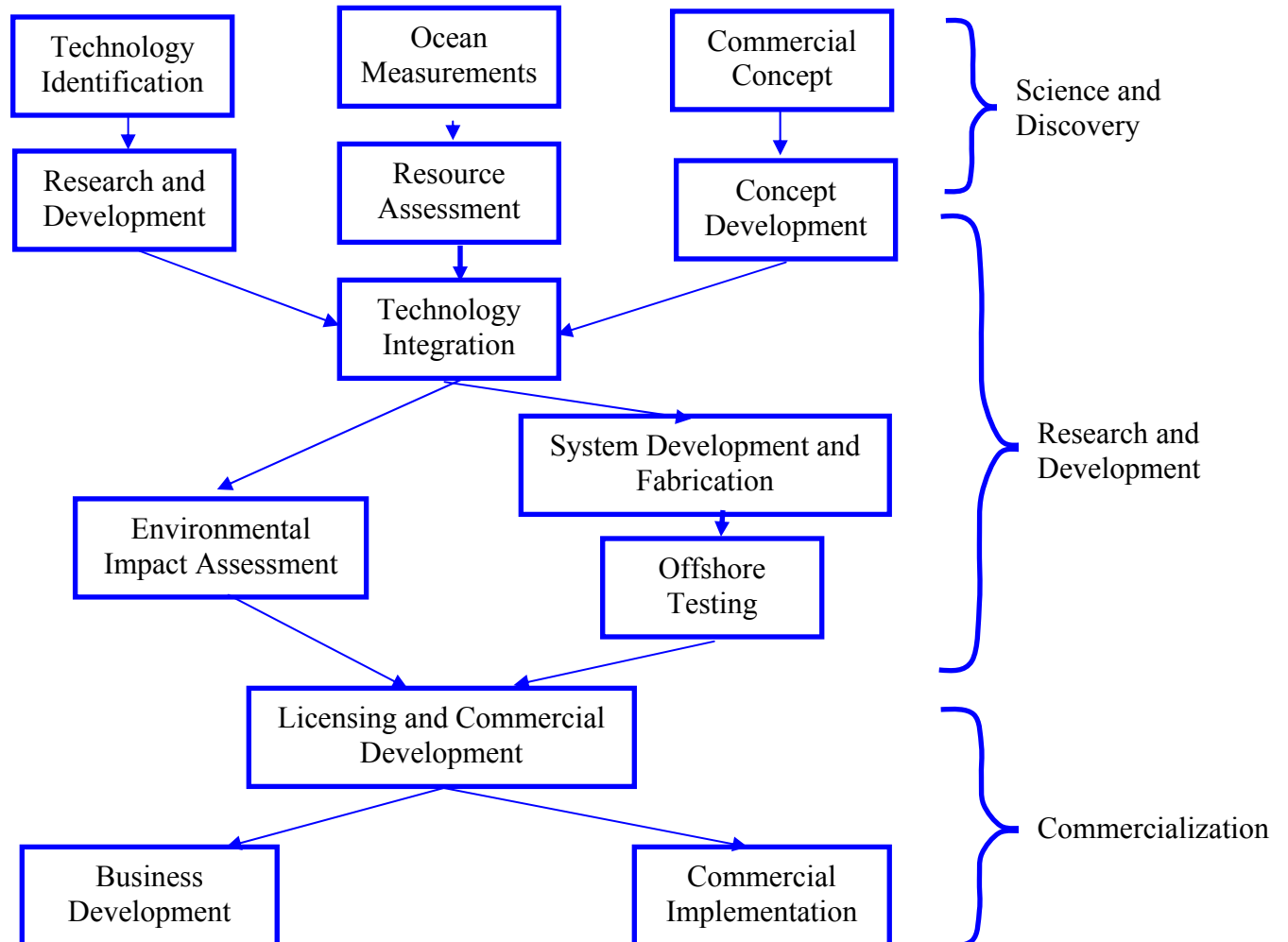
COEOET is to be based at Florida Atlantic University's SeaTech Facility, which is strategically located next to the most energy dense waters in the continental U.S. Directly offshore, the Gulf Stream (the most energy dense ocean current) lies at its closest location to land along the entire eastern seaboard, with speeds of five knots, and pumps nine billion gallons of warm water per second through the Straits of Florida. Furthermore, water temperature of 30 °C at the surface and 14 to 4 °C at water depths of 250 – 400m, respectively just offshore of SeaTech, provides a high potential for ocean thermal energy and complementary systems such as distributed cold water based air-conditioning systems. Most forms of renewable energy are subject to intermittency, such as times when the wind does not blow, the sun is not shining, and the ocean is calm. The Gulf Stream is always flowing and the thermal gradient is always present offshore Florida, ensuring a continuous supply (a 100 % capacity factor) of clean energy. This unique location is also situated near a major electric load (usage) center (South Florida), a capable marine industrial base, a deep water port (Port Everglades), a large offshore testing range, (The South Florida Testing Facility); also, SeaTech shares facilities with a major government ocean engineering lab (the Naval Surface Warfare Center Carderock Division), and a respected oceanographic academic institution (Nova Southeastern University Oceanographic Center –NSU OC). In addition, FAU is a leader in the existing South Florida Ocean Measurement Center comprising FAU SeaTech, the U.S. Navy, and NSU OC. A rich and continuous supply of energy near a major load center coupled with local research capability makes Florida the ideal place to develop and refine technologies that may initially be uneconomic or unfeasible elsewhere.

The development of ocean energy technologies and industry requires an intimate knowledge of Ocean Engineering, Renewable Energy Engineering, Oceanography, and Marine Biology supported by capable testing facilities and equipment, and a strong means of workforce development. The combined expertise and training capabilities and the operational know-how, facilities, and equipment of the COEOET partners provide unique qualifications through the combination of expertise, location, and vision to achieve the COEOET goals:

1. to develop a world-renowned center to support science, research, engineering, development, testing, and commercialization of ocean energy technologies;
2. to install the first ocean energy testing facility with the in-situ sensor and data acquisition systems necessary for technology development and testing;
3. to develop a training and education center with up-to-date equipment for building the required ocean energy workforce;
4. to establish a seed industry in ocean energy and support its growth towards becoming a Florida based world leader;

5. to design efficient, cost effective technology and systems for harnessing ocean current and thermal energy and their optimal deployment off the Florida coast, leading to their development, demonstration, and commercialization;
6. to design optimal systems and technology for cold-water-based cooling systems, their development, demonstration, and commercialization;
7. to implement a prototype ocean power plant and cooling system at FAU's SeaTech Campus to assess its effectiveness, make improvements, and provide projections of impact of commercial systems;
8. to assess environmental impact of implementing ocean energy harnessing systems in Florida waters; and
9. to develop hydrogen and potable water generation technologies driven by clean ocean energy.

Integrated Research and Development Strategy



COEOET will establish a nucleus of core capabilities not currently available in Florida needed to propel the research, development, and commercialization of ocean energy technologies. The Academia/Industry/Government partnership model will drive the science, research, and engineering needed to discover, investigate, and refine enabling technologies. Simultaneously,

the strong academic environment and substantial hands-on testing facility will provide the backbone to develop the workforce necessary to establish an ocean energy industry. The science, research, and engineering will drive technology development and create viable new energy technologies and products. Working with industry partners and utilizing FAU's established technology transfer program, the technology and products will be transferred to the seed industry, thereby establishing and growing a Florida based ocean energy industry.

Stimulation and Support for New Venture Creation

As part of the technology development plan, COEOET will solicit proposals to fund the development, testing, and commercialization and environmental impacts/mitigation of promising technologies related to ocean engineering. All proposals will be required to culminate in the implementation of a prototype system capable of producing a base load. 30% of the funding will be dedicated to this effort. To ensure that the proposals meet the goals of the COEOET and of the Centers of Excellence program, the following criteria will be used to score the proposals: 1) matching funds committed, 2) innovation of the proposed technology, 3) Florida economic development potential, 4) technical feasibility, 5) energy production potential, 6) Florida location served, and 7) public integration. Between two and five grants are envisioned to be funded. Awardees will be expected to work closely with the COEOET, who will support the effort with engineering, environmental assessments, testing, and commercialization. Highest weighting will be given to the development and the economic development potential for Florida and to matching funds committed. All funded proposals must also have a sound management plan and clear path to commercialization. To review and select the proposals, a review team consisting of the Principal Technical Personnel, Chair of the Research Advisory Committee, Chair of the Technology Transfer Advisory Committee, and two other members of the COEOET will be created.

Technology Transfer Plan and Past Performance

The Center's approach to start with the academia/industry/government partnership, rather than to end with it, will serve as a platform for the Center to develop and implement new and innovative systems and processes to improve technology transfer. The FAU Office of Technology Transfer will take the lead in working with all Center partners to establish an industry/economic development centric transfer initiative that will be transferable to other industries, markets and institutions. Since its inception in 2001, the FAU Office of Technology Transfer has recorded 245 inventions, issued 40 patents with another 92 patent applications currently pending, issued 17 license agreements, and received over 1.4 million dollars in licensing revenue.

FAU's Office of Technology Transfer in partnership with FAU's newly created Office of Corporate Relations for the Division of Research is now leading the way in providing a successful path for commercially viable technologies to reach the marketplace. One of the unique advancements in FAU's technology transfer process is the recent creation of a gap funding program to bring new inventions closer to commercialization. One of the leading problems in university technology transfer is the inability to develop an invention and provide sufficient proof of concept for industry; thus, resulting in a gap between the invention's state of development and industry's expectations. Unfortunately, this prevents many commercially viable inventions from reaching the marketplace. FAU's innovative approach through the gap funding program will allow inventors to make proposals to a Gap Funding Committee for grants up to \$20,000 enabling the further development of an invention towards commercialization

New Venture Creation and Incubation

The new venture creation process is stimulated and supported by FAU's College of Business, which was included in *SUCCESS* magazine's 2001 list of Top 50 Business Schools for Entrepreneurs, and by the Adams Center for Information Technology Entrepreneurship and Venture Capital. The Center will work with COEOET partners and grantees to ensure that all technology with commercial potential that is developed through work funded by the Center is transferred for public benefit (while complying with each organization's policies on patents and copyrights). FAU's Office of Technology Transfer will be the focal point for communication among the participants on these matters and will coordinate the interactions and transactions that involve the Center. The Enterprise Development Corporation of South Florida will provide business related assistance in launching start-up and spin-out companies that are appropriate platforms for further product development. A 52-acre Research & Development Park located at the FAU Boca Raton campus and on 10 acres in Deerfield Beach in Boward County, Florida, also offer opportunities for first and second stage business incubation.

Performance and Accountability Measurement System

The comprehensive performance and accountability measurement system used by the Center will be the federal regulations found in the Office of Management and Budget Circulars A21 and A110. These strict cost principals for educational institutions are currently used by FAU to set up grant awards through FAU's Sponsored Research department and to monitor expenditures by FAU's Contracts and Grants department (both in the FAU Division of Research). To this end, FAU has an established certified Banner program management process that uses financial tracking and reporting tools.

As with all large, technically challenging projects, SeaTech-FAU will set up an oversight team to be composed of Center representatives from all appropriate functional disciplines working together to build a successful and balanced program. Additional members will include a professional company for consultation and oversight management. Informal monthly meetings and agenda-driven teleconferences are proposed between awardees of the new venture technology grants and the oversight team, throughout the duration of the grants. All meetings will be documented, tracked, and action items will be covered during weekly and monthly team review meetings.

As the Center receives grant money, FAU will subcontract all participating organizations, which will verify their ability to comply with these regulations before funds are released. The various organizations' Offices of Sponsored Research and/or Business Development will provide guidance and ensure compliance of all necessary performance and accountability requirements.

Competitive Analysis

Throughout the world, there are many small industrial ventures into ocean energy extraction, most focusing on ocean wave energy and funded through a combination of governmental and private investment. Unfortunately, most are unable to make the jump from concept to commercialization because of lack of engineering expertise, inadequate start-up funds, and insufficient access to cost-effective testing facilities. There is only a handful of governmental efforts in the U.S. and abroad for the development of ocean-generated power. Most foreign development work, such as that in the UK and Korea, is funded/driven at the national (federal) level, whereas most U.S. efforts are largely conducted on a state-by-state basis. Only one university-led center exists, the National Institute of Ocean Technology in Madras India, which performs ocean-energy research and simultaneously collaborates with both industry and

government to stimulate the development and rapid transfer of renewable energy technology to industry for commercial implementation. However, the NIOT center in India specializes only in Ocean Thermal Energy Conversion. In the U.S., such an organization does not exist. Thus, the Center of Excellence in Ocean Energy Technology's focus on ocean current and thermal energy is unique and will give the Florida energy industry and workforce a strategic advantage when it comes to the development and commercialization of ocean-current energy technologies. The Florida-based COEOET will also be a unique national and international asset for the development of all forms of ocean energy.

4.2 Research Focus

Overview of Research Program

The ocean is a source of two significant sustainable forms of energy: *thermal energy* associated with the sun's heats absorbed by the ocean, and *mechanical energy* associated with the waves, currents, and tides. Since the oceans cover over 71% of the earth's surface, they represent the largest solar collectors and retainers of the sun's vast energy that reaches the earth's surface – an estimated 10,000,000 Gigawatts (GW). Just a small fraction of the ocean's energy could power the world.

The Gulf Stream Current flows northward past the southern and eastern shores of Florida, funneling through the Florida Straits with a mass transport greater than 30 times the total freshwater river flows of the world. The steady currents of the Gulf Stream, in addition to those found in other regions of the world, are highly energetic and carry with them enormous potential for electric power generation. The ocean flow of the Gulf Stream is more than five times as energy-dense as the world's best wind power-generating sites. The ocean current energy resource of Florida has a potential generating capacity in excess of 10 GW, equal to some 10 nuclear power plants. The Gulf Stream has an annual average flow velocity of 1.56 m/s in its core, with a summer average of 1.69 m/s and a winter average of 1.42 m/s. This flow creates the potential for base-load, summer-peaking energy generation with an annual average power density of 1.95 kW/m² and an average summer power density of 2.52 kW/m². The channel bathymetry creates a directionally steady flow once sufficiently offshore, the mean deviation from north is typically +/-3 ° within 100 m of the ocean surface.

The warm surface water of the Gulf Stream overlays colder water that flows into the Florida Straits from the Arctic regions through the deep ocean. The temperature difference exceeds 22 °C between these waters, with the deep ocean water averaging 4 °C, yielding an energy difference of over 100 MW/m³ of seawater. Florida is the only place in the continental U.S. with these beneficial conditions. Not only can the temperature difference be used to directly create electricity using Ocean Thermal Energy Conversion (OTEC) technology, the cold water can be used in heat exchangers for air conditioning (up to 45% of Florida's residential electricity consumption is used for air conditioning). The cold water can also be used to generate fresh water, for aquaculture, to cool thermal effluent from existing power plants, and to mitigate fresh water discharge into coastal estuaries.

COEOET will consist of a core team based at FAU-SeaTech, off-site discipline-specific teams, and the instrumented offshore testing range operated by the South Florida Testing Facility. Leveraging Florida's energy dense waters, the COEOET will research and develop technologies that are cost-competitive with hydrocarbon-based power generation and have the ability to operate for long periods in the harsh ocean environment. Applying proven methods and integrating new advances in ocean and renewable technology, new systems will be created that

not only operate in the corrosive sea water, subject to biological fouling, but are also able to be deployed, recovered, maintained, and operate in the strong forces of waves, currents, and hydrostatic pressure. Consistent with renewable energy philosophy, COEOET will aim to develop technology, systems, and extraction methodologies that achieve minimal environmental impact.

Research and Development Focus Areas

To accomplish the goals of the COEOET, six core areas of Research and Development (R&D) focus are planned: 1) a research thrust with science and technology efforts aimed at filling the technology gaps needed for viable, efficient, cost-effective, environmentally sound ocean-energy technology and systems, 2) development of hydrogen and potable water generation technologies driven by clean potential and kinetic ocean energy, 3) assessment of the ocean-energy potential of Florida and characterization of the operating environment, 4) environmental impact analysis and mitigation, 5) development of infrastructure and an instrumented testing range to facilitate technology and system implementation and refinement, and 6) research, development, and deployment of ocean energy harvesting systems and the necessary workforce. In addition, the COEOET plans to implement a prototype ocean power plant and cooling system at FAU's SeaTech Campus to assess its effectiveness, make improvements, and provide projections of impact of commercial systems. To support cost-effective testing, evaluation, refinement, and commercialization of ocean energy technology and harvesting systems, we will develop an instrumented testing range in the South Florida Testing Facility offshore from the SeaTech facility.

Tool Development using Modeling and Simulation

The ocean is a dynamic environment characterized by temporally and spatially varying currents, waves, winds, temperature, and salinity. Any system operating in or on the ocean must survive not only under calm or moderate conditions, but strong storms and other conditions as well. Thus, predicting the response of any ocean system to the non-stationary and non-linear ocean environment is a necessary task to ensure a design will survive and function properly. There is a need for improved marine condition simulations to reduce the time and cost needed to bring a concept to a marketable stage. The key to rapid, robust, and economic design of an ocean system is through comprehensive numerical simulations.

The COEOET modeling effort will build upon and couple together existing marine hydrodynamic simulation efforts. The numerical simulation will be a full dynamics model that will replicate the response of different ocean systems to ocean and internal disturbances. The finite-element based simulation will be modular and easily modified to investigate different systems, system design changes, as well as to optimize system performance. Such a simulation tool will provide rapid design evaluation and virtual system testing prior to construction, resulting in significantly reduced lead times and design costs. FAU is a leader in developing marine dynamics simulations and many software modules are in use at Navy labs and industry.

Durability Through Corrosion Control, Material Selection, and Advanced Coatings

Structural steels have been the historical material of choice in the ocean environment because they possess good strength, toughness, and fabrication properties and are relatively inexpensive. For marine applications of the future, however, likely structural material candidates include (1) high strength steels, (2) high strength aluminum alloys, (3) composites, and (4) stainless steels, including corrosion resistance alloys (CRAs). The first of these (high strength steels) affords the obvious advantage of greater strength and a corresponding weight reduction; and considerable

research effort regarding these has transpired during the past several decades. However, considerations such as reduced ductility and toughness (these generally render such materials more susceptible to environmental cracking and brittle fracture than lower strength counterparts), weldability, and fatigue resistance have limited their use. The last of these (fatigue resistance) may constitute a technological barrier because fatigue strength of notched or freely corroding high strength steels is about the same as the low strength counterpart. For this reason, structural marine applications have been limited strength-wise. However, these and related limitations apply to other material classes as well (aluminum alloys, composites, and stainless steels).

A great deal of attention has developed with regard to smart coatings that are intended to provide enhanced or additional properties to the surfaces to which they are applied. Experience in dealing with trade-offs in performance of advanced coating systems will be an important aspect in producing a marine hardware application with durability while utilizing appropriately selected advance materials. Thus, the research and development efforts will focus on choosing the best materials, coatings, and corrosion control for each technology.

Composite Materials

Our continuing quest for lighter and stronger materials has fueled the prolific growth of research in the area of composite materials during the last several decades. Higher specific strength and stiffness, improved corrosion resistance, low maintenance and life cycle cost, and most importantly, lower production costs with newly developed processing techniques have made composite materials very attractive for structural applications. Traditional metals and alloys are quickly being replaced by composite materials in almost every industry. Power industries, and in particular, ocean energy related industries are no exceptions. If composite materials are to be strengthened further, nanotechnology can be incorporated by including nanoparticle-modified matrices and core materials in the composite structures. This implementation will involve the dispersion of nanometer size inorganic particles such as nanoclays, carbon nanotubes (CNT), or carbon nanofibers (CNF), etc., into the base polymers and follow the traditional composite materials fabrication routes. Such infusion of a nanoscale inorganic phase into a polymer should improve the mechanical properties, durability and barrier properties of composite materials because of the intense interaction between the particle and the polymer at the nanoscale. Research and Development efforts will identify or develop appropriate composites and manufacturing methods that are best suited to increase the performance, durability, and longevity of ocean energy technologies.

Hydrodynamic studies and efficient system development

Hydrodynamics studies will include determination of: 1) efficiencies of the ocean energy generating systems under various prevailing conditions, 2) wave and current related dynamic loads on the prototype systems, 3) thermodynamic and heat transfer considerations for ocean thermal systems, 4) efficient turbine designs, 5) wave energy capacities, and 6) required dynamic scaling for scaled model systems. The work will involve computational fluid dynamics (CFD) studies, carried out in conjunction with the numerical and simulation studies described above, and laboratory experimentation.

Testing Range Development

Offshore of FAU's SeaTech campus is an ideal location for an ocean energy testing range. The Naval Surface Warfare Center Carderock Division's South Florida Testing Facility (SFTF) operates a large environmentally-permitted range in this area that covers from the near shore to

over 24 nautical miles offshore, and running over five miles parallel to shore. The SFTF brings decades of at sea operational experience to the proposed center. The range is instrumented with many acoustic and magnetic sensors, as well as a few environmental sensors, all connected to the shore by cables. NSU OC also has a history of environmental research in this area, compatible with that of the SFTF and FAU through SFOMC operations. NSU OC maintains a deepwater Acoustic Doppler Current Profilers (ADCP) in continuous operation for over seven years and intends additional ADCP deployment in support of ocean energy development.

To support testing and evaluation, the offshore range is to be augmented with fixed and mobile arrays of sensors for measuring environmental conditions, such as current, waves, temperature and salinity. As well, several sensor nodes will be installed along an existing cable, extending from the shore to 15 miles offshore. This will allow instruments, cameras, and other required sensors to be attached in a plug-and-play fashion, and to connect directly with our shore facilities for communication and powering. Thus, as new technology and systems are developed, the test range can be rapidly and cost-effectively tailored to meet the testing requirements of these systems.

Development of Ocean Powered Hydrogen and Potable Water Generation Technologies

Research and development is needed to obtain a renewable replacement for the present fossil-based fuels and economy. Most experts agree that hydrogen (H_2) is poised to be the fuel of the future. It is important to note that hydrogen is an energy carrier much like electricity – not an energy source. So, hydrogen must be made using a primary energy source such as natural gas, nuclear or renewable types of energy. To realize the full benefits of hydrogen, it is essential to find cost-effective, renewable, and clean technologies that allow its production and storage using renewable resources such as solar energy, wind, ocean currents, etc. Hydrogen can be used in any application that now requires fossil fuels. Hydrogen is a clean burning fuel, and development of a future hydrogen economy offers Florida the opportunity for the establishment of a high-technology industry. Researchers at the Florida Solar Energy Center (FSEC) at the University of Central Florida (UCF) have been engaged in the development of H_2 production, storage and utilization technologies since 1985.

As a partner in the FAU's COE proposal, FSEC will research, design and implement a hydrogen production process based on the proton exchange membrane (PEM) electrolysis of sea water using electrical energy generated by kinetic ocean and/or thermal energy. Previous work has shown that the amount of the hydrogen generated by PEM electrolytic process is proportional to the electrode current density and increases as the electrode gap narrows and electrolyte temperature is increased. Screen printing technology can be used to fabricate inter-digitized electrodes. In that case, the anodes consist of ruthenium dioxide film printed on top of a platinum layer that limits the anodic formation of oxygen. By optimizing the inter-electrode gap and use of an external mixing tank for the production of hypochlorite, it is possible to achieve electrolyzer current efficiency of 80% and conversions exceeding 30% without scale deposition on the cathode surfaces.

The basic R&D activities related to this proposal include the development of resilient electrode and membrane materials for the electrolysis of sea water and cost effective hydrogen storage methods. FSEC/UCF has considerable experience and track record in the areas of hydrogen production and storage, detection and sensing, utilization and fuel cell technologies. In recognition of its achievements, FSEC was designated a Center of Excellence in Hydrogen Research and Education by the U.S. Department of Energy in 1997. FSEC has been the lead for

the Hydrogen Research at Florida Universities program funded by the NASA-Glenn Research Center since 2002.

Ocean Current Technologies

The Department of Ocean Engineering at FAU and the SFTF have an established track record of working with industry partners to investigate, develop, and test ocean energy harvesting technologies. One such example is the C-Plane. FAU has worked with Aquantis LLC to develop the C-Plane concept, which is a hydrodynamic underwater electric power generation platform designed to operate in steady ocean currents. The C-Plane's twin counter-rotating (torque-balancing) rotors, drive trains, controllers, and power collection system are direct derivatives of enabling technology currently employed in wind turbines. FAU has lead areas of the C-Plane design effort, including flight stability optimization, component sizing and placement, flight control development, physical model testing, and site location studies.

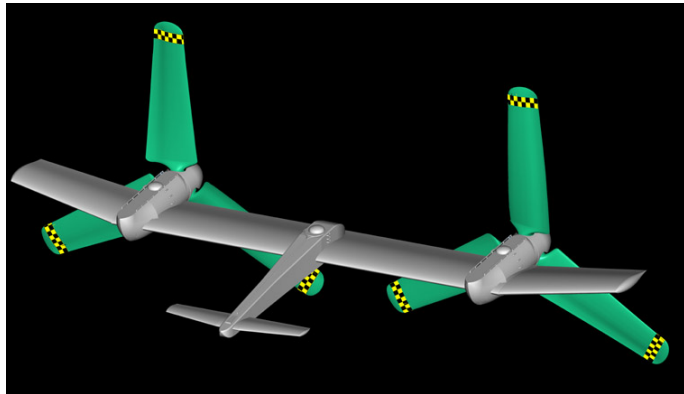


Figure 1 The commercial-scale Aquantis C-Plane with twin 30m diameter rotors.

Within the C-Plane design, and within all other ocean energy harvesting designs, there are many critical challenges to develop enabling technologies, including: sensors, actuators, gear boxes, generators, software, control systems, underwater connectors, underwater power transmission, etc. Research will be aimed at: 1) achieving viable functional designs, 2) reducing both component and system costs, 3) cost effective and safe deployment systems and procedures, 4) autonomous operation with high degree of reliability, 5) low operating and maintenance costs, 6) environmentally friendly life cycle systems. 7) reducing costs for existing shoreline concepts, 8) lowering manufacturing and installation costs, and 9) extending the lifetime, reliability, efficiency and safety of the systems. The members of COEOET have unique capabilities to address and solve these technology gaps. COEOET expects to support technology development through in-house research and development and by working with companies funded through the Center's grant program, funded through Florida's Renewable Energy Technology Grants Program, or are self-funded.

Ocean Energy Resource Assessment and Environmental Characterization

Numerous oceanographic studies have measured the physical properties and circulation patterns of the ocean offshore of Florida to develop dynamic ocean models. In addition, many biological studies have been performed to assess the fauna in the ocean and to understand their behaviors and interactions. Oceanographic observations have shown that the Gulf Stream has a large capacity to generate power and that there are large thermal gradients and very cold deep water offshore, but there are not sufficient or appropriate measurements needed to characterize the energy resource or for developing underwater ocean power systems. For example, the Gulf Stream is not a uniform flow; it has a strong core with velocity decreasing (shearing) away from the core. More information about the variability of the vertical and horizontal velocity shear in the Gulf Stream is required - a critical piece of information needed to help optimize the

survivability of designs while lowering costs. Other unknowns are the effects of hurricanes, the existing ecological condition, and what potential environmental impacts the systems would have. Environmental measurements will also help to design a system that has minimal or beneficial environmental impact. Using the instruments in the proposed test range, as well as instruments aboard research vessels, the COEOET will characterize the ocean environment offshore southeast Florida through long-term measurements.

Environmental Impacts

Even energy technology that does not consume nonrenewable natural resources or produce pollutants in their normal operation will have (often significant) interactions with the environment that need to be quantified and evaluated. Potential interaction effects include variation in local ocean currents, fish attraction and production, local nutrient enhancement in surface layers, effects of biocontrol measures, marine mammal interactions, and accidents. Effects may range from subtle to large on current flow and on climate. There may be scaling effects related to the size of the energy generation operation. The quantification of these interactions is important. Ideally, impacts can be well quantified and translated into common units. In other cases, impacts may be more difficult to measure and define (such as on rare or endangered species). Monitoring of any prototype will be crucial for complete understanding of the range of possible primary and secondary impacts that may occur. Assessments will therefore be an objective analysis of both quantitative and qualitative measures. Finally,

Cold Water-Based Cooling System

In South Florida, artificial upwelling holds a significant potential for sustaining aquaculture, fresh water generation, and alternate energy production/reduction. The scheme is economically feasible only where there is deep water close to shore. Economics improve where metropolitan populations are also close to shore. Fort Lauderdale is located at the closest approach of deep water to shore in the continental U.S.

The concept is to pump cold, deep, offshore water up to shore through large diameter pipes through a heat exchanger. The heat exchanger provides a source of cold (approximately 40-degree Fahrenheit) air to cool shore-side structures. This air, when cooled, condenses fresh water which passes to storage tanks to be used for drinking water. On leaving the heat exchanger, the clean nutrient rich ocean bottom water rises to near ambient temperatures and runs into lagoons and near-shore tanks and ponds where it will stimulate the photosynthetic process by providing the necessary nutrients. The resulting phytoplankton can then sustain organisms higher up the tropic chain. Though human intervention, Lake Okeechobee and the Everglades are drained in anticipation of storm events. An unforeseen consequence of this is massive fresh water dumps into sensitive ecosystems such as the Indian River lagoon. Artificial upwelling may mitigate this process, as a ready supply of seawater would exist to add salinity to fresh water draw-downs.

The COEOET will seize the opportunity to lead the state and the nation in basic and applied research towards the use of artificial upwelling for sustaining, aquaculture, fresh water generation, and alternate energy production/reduction. Aside from the ocean engineering problems, we will work with our partners on the solution and exploitation of this technology for mariculture and habitat enrichment.

Research Abilities

Florida Atlantic University – FAU is a public university with over 26,000 students and an annual research expenditure exceeding \$68 million. SeaTech, a \$2 million state funded research

center, is FAU's Institute for Ocean and Systems Engineering, located in Dania Beach, Florida, with easy access to the ocean (www.oe.fau.edu). Established in 1997 as a state-funded Type II Research Center, the Institute is part of the Department of Ocean Engineering. Its 50,000 sq. ft. building houses oceanfront research laboratories, offices, and conference rooms and provides dockage for its two research vessels and other boats from visiting institutions. SeaTech's team of world-class faculty, engineers and graduate students are engaged in federally and industry sponsored ocean engineering research and technology development in the areas of acoustics, marine vehicles, hydrodynamics, and physical oceanography, marine materials and nano-composites. Major achievements include the development of several autonomous underwater vehicles designed for mine-counter-measures, oceanographic measurements, and search and survey. Fire-and-forget rapidly-deployable GATEWAY buoys that provide easily deployable navigation and communication networks for underwater vehicles have also been developed and licensed. Other accomplishments include underwater sonar systems and sub-bottom profilers, USVs, and oceanographic sensor systems. Current faculty and center members are of a world-class caliber as judged by any measure as highlighted in their resumes.

University of Central Florida - The University of Central Florida was established in June 1963. The Fall 2001 enrollment is 35,927 students, including 4,840 graduate students. UCF provides intellectual leadership through 76 baccalaureate, 57 masters, 3 specialist and 19 doctoral programs. It serves as a major intellectual and creative resource, and develops creative partnerships with public and private enterprise. During each of the last two years, UCF has added over 100 new faculty members and growth in research has been equally dramatic. Research and development strengths lie in electro-optics (Center for Research and Education in Optics and lasers), energy (Florida Solar Energy Center, <http://www.fsec.ucf.edu>) and simulation and training (Institute of Simulation and Training). New initiatives at UCF include nanoscience, materials technology and miniaturization of engineering systems. Research on nanotechnology has a substantial and growing presence at UCF. This year, the State Legislature provided \$2.5 million for a nanoscience initiative. The Advanced Materials Processing and Analysis Center (AMPAC) (<http://pegasus.cc.ucf.edu/~ampac/home.html>) is a world-class, multi-disciplinary center focused on the development, processing and characterization of advanced materials. The Lucent partnership recently led to the establishment of the Materials Characterization Facility (MCF), which is the most complete analysis, and characterization facility in the southeastern US. The College of Engineering and Computer Science runs the Consortium for Miniature Engineering Systems. Very close collaboration in the miniaturization area has been established with local companies, including Lockheed Martin.

Florida Solar Energy Center - The Florida Solar Energy Center has a long history of R&D funded by U.S. DOE, and DOE has a thorough knowledge of FSEC's program strengths – especially in the areas of hydrogen production & storage, and fuel cell technologies. In particular, FSEC has received funding from DOE in hydrogen and fuel cell areas since 1985. In 1997, FSEC was named by U.S. DOE a Center of Excellence in Hydrogen Research and Education. Recently, FSEC has received a five-year contract from DOE to conduct research and coordinate the activities of a group of researchers from universities, National Labs and industry. For this program, FSEC will oversee DOE's high-temperature, low relative humidity membrane fuel cell program. In addition to FSEC's long-standing work in hydrogen for DOE, we have participated in and coordinated a four-year \$28 million NASA funded project in hydrogen research. This activity required extensive research as well as coordination of hydrogen-related R&D at seven Florida universities.

Nova Southeastern University Oceanographic Center - The Mission of the NSU OC is to carry out innovative basic and applied research and to provide high-quality graduate and undergraduate education in a broad range of marine-science and related disciplines. The Center also serves as a community resource for information, research and education on oceanographic and environmental issues. NSU OC focuses on physical oceanography and marine biology. Faculty are highly skilled in environmental assessment of impacts of and mitigation for large scale energy and other marine construction operations. NSU OC has a fleet of small research vessel capability, ocean modeling, and marine biology assessment and related facilities and equipment. Its integral National Coral Reef Institute and Guy Harvey Research Institute well cover the range of ocean life that will need evaluation and assessment.

Recruitment and Retention Plan

COEOET will actively hire world-class, leading-edge scholars in ocean engineering, renewable energy engineering, environmental engineering, marine biology, and oceanography. Presently, there are currently five searches for faculty and postdoctoral researcher in the subject area of this Center at FAU with an anticipated 14 faculty and postdoctoral researchers over the next three years. Graduate student participation is a core component to the success of the center and it aims to attract up to five masters and 11 Ph.D. level students through research assistantships and tuition wavers to conduct research within the Center's focus areas. Funding of this center will be of enormous assistance to future recruiting at all levels. The implementation of the academic/industrial/governmental working relationship, the advanced instrumented test range, the new training programs, new faculty hires and the physical resources such as a core facility will make FAU an even more attractive location for future hires.

Plan for Encouragement, Recognition, and Reward

The Center's plan for encouragement, recognition, and reward for faculty, student and industry participation in commercialization and industry/university/government/research institution collaboration will begin with communication. The Program Manager, through regular email updates and regularly scheduled meetings, will keep all participants informed on the progress of all research projects, scientific and personal achievements, technology transfer activities, and other related information.

The Center will prepare press announcements that will be released by all participating organizations. The Center will also publish a quarterly digital newsletter that will highlight the achievements of the Center, such as inventions, publications, and private and government funding awarded to the Center. As a financial reward, each organization will distribute income from an invention or joint invention according to its own policies and procedures. At FAU, inventors are generously compensated using net income generated from the license of an invention on a sliding scale that also includes a funding stream for the organizations involved. FAU has also implemented a Faculty Incentive Program Award that recognizes faculty who have excelled in research and who have brought in significant grant funding. Annual award amounts range between \$100 and \$5,000 and are based on a two-year average of research expenditures.

4.3 Economic Impact Potential

Renewable energy will play a greater role in generating electric power world-wide. While wind and solar energy are the most advanced forms of green energy, ocean power has the greatest potential. The key to development is establishing a few facilities to demonstrate its viability and

to refine the technology. The COEOET will thus serve as a science and technology incubator that will establish a local and global technology center in Florida for ocean energy.

Local Impact

At present, South Florida's energy consumption is approaching capacity. In fact, during the summer, demand sometimes exceeds capacity, and energy is imported. Florida Power and Light is planning to install at least 6 GW of additional hydrocarbon-based capacity within the next several years to meet demand. A reasonable 10-year program could meet FPL's power goals with green renewable energy and see as much as 5 GW of capacity generated from the Gulf Stream and up to 2 GW of equivalent cold-water-based air conditioning. COEOET aims to develop technology that is cost competitive with wind and hydrocarbon based power generation (an operating cost of \$0.04 per KWH), thus, assuming a wholesale price of \$0.06 per KWH, an annual revenue stream of over \$3.5 Billion can be generated in South Florida alone. To accomplish this, as many as 3,000 individual ocean current power generation systems will need to be fabricated and dozens of cold water pipes must be installed. Although the construction and installation of the local harvesting systems will generate in the order of 10,000 technical jobs alone, engineering and technical efforts will yield a new high-tech Florida-based sector with potential for several thousand more high-skilled positions. System management, maintenance, and repair of the harvesters and support systems are likely to create at least 10,000 more jobs.

Through the development and integration of ocean-energy harvesting systems and hydrogen producing technologies, Florida will have an in-state source of fuel for future vehicles and industry. This will yield energy independence from external sources of fossil fuels and provide a reliable cost effective energy source, ultimately resulting in a more stable economy. Fresh water generation from ocean energy may also produce sufficient water to relieve the burden on the Everglades and the Florida Aquifer. In combination, these areas have a potential to generate a multi-billion dollar sector while keeping funds that have traditionally gone to national and international suppliers of fossil fuels within Florida's economy.

National and International Impact

The oceans are the biggest solar collector on earth and have sufficient power to meet the present and future energy needs of the planet. Most of the energy dense ocean sites are located in deep water that is far from shore and outside of all the Exclusive Economic Zones. Thus, unlike oil and other land based forms of energy, ocean energy is accessible and not subject to local politics or stability of individual counties. The first viable technology sector capable of producing a system that operates in the deep ocean, harvests this energy, and transports it to market will become the leading energy producer.

As the technology is refined, costs will decrease and efficiencies will increase, thereby making the technology feasible for other sites. Florida's unique location and local expertise are a natural advantage that will push it to the international forefront in ocean energy technology. The COEOET will be the enabling capability and will establish the seed industry. With the realization of offshore hydrogen generation and storage technologies, energy generated by ocean-energy harvesters can be converted to hydrogen and stored for later use. Therefore, the rich open ocean energy that is located at sites far from shore, beyond power transmission range, will become economical to produce. The offshore energy harvesters become "hydrogen wells" from which tankers or pipelines can transport the hydrogen to an energy market. If Florida takes the lead in ocean energy technology through establishing the COEOET, a technology hub will be

created that will be on par with conventional oil technology centers with the potential to bring hundreds of billions or even trillions of dollars to the national economy.

Plan for Infrastructure of Proposed Center

To support the inception, growth and diversification of technology-based businesses and ventures in Florida, the Center will work closely with the Enterprise Development Corporation of South Florida, a non-profit organization whose mission is to facilitate the creation and growth of science and technology entities. Since 1994, Enterprise Development Corporation of South Florida has assisted companies that have raised \$77.7 million in capital funds, increased sales revenues by \$101 million, created 165 new products, created 2,312 direct jobs and 3,192 indirect jobs, generated \$6 million in sales-tax revenues from jobs and annual salaries of \$203.7 million. To support its mission, Enterprise Development Corporation has been extremely successful in raising nearly \$1.2 million over the last three years from local, state and national government sources as well as local industry, business and foundations. Enterprise Development Corporation will meet with the Center's team on a regular basis to monitor Center projects and provide support for commercialization and new venture creation.

Plan to Stimulate Startups/Manage Barriers to Commercialization/Encourage Entrepreneurial Activity/Business and Community Support

The Center will stimulate start-ups based on the new venture creation model described in Section 4.1 and encourage entrepreneurial activity based on FAU's new company spin-out process. Through the support of the FAU Technology Transfer Advisory Team, the vast business networks of the Enterprise Development Corporation of South Florida and the FAU Office of Technology Transfer, and other community resources, the Center will ensure that the necessary elements are in place to foster new start-ups.

Plan to Manage Barriers to Commercialization

The Center is prepared to identify potential barriers to commercialization and manage them based on the existing, proven policies and procedures already in place at FAU and the other participating organizations. The Center Program Manager will monitor these matters to be sure they are dealt with in a timely manner, should they begin to surface. In particular, as the COEOET supports multiple technology efforts, "fire wall" procedures will be placed between projects and any potential conflicts of interest will be managed by the technology transfer committee.

Business Incubation Program/First & Second Stage Incubation

FAU currently offers opportunities for first and second stage business incubation through its 52 acres Research and Development Parks located at its Boca Raton campus and 10 acres in Deerfield Beach, Florida. In addition, land and office space is available through the SeaTech Facility, SFTF, and Harbor Branch. For early stage companies, it offers an established Business Incubation Program that is managed by the Enterprise Development Corporation of South Florida. As young companies develop, they can move into larger offices within the Park ranging between 5,000 – 200,000 square feet, depending upon their individual requirements. The incubator is actively involved with the National Business Incubator Association and the Florida Business Incubator Association, ensuring that best practices are in place. At both stages, companies have easy access to cutting-edge technologies evolving from the University, access to University resources and facilities, and access to students for intern and co-op opportunities.

Technology Transfer Plan and Past Performance

FAU has a unique and innovative technology transfer plan that is detailed in section 4.1 and has a strong performance history transitioning technology from the University environment to industry. The technology transfer plan starts with the academia/industry/government partnership, and combines generous faculty incentives, gap funding to ensure transition, and the necessary business oversight to ensure successful transition.

Specific Tangible Outcomes

Based on the historic performance of technology centers within the University, we expect the funded research expenditures to produce many (10+) inventions and patents, and generate a revenue stream of over \$1 million per year within five years and over \$3 million per year within 10 years (based on 0.1% royalties of net energy sales). The Center's inventions and resulting products will be: 1) new viable technologies and systems for harvesting the ocean current and thermal energies; 2) new methods and a prototype demonstrator for cooling buildings with cold ocean water; 3) assessment of the energy potential of Florida waters, including the identification of new ocean energy sources; 4) a seed industry that will establish Florida as the leader in ocean energy technologies and development; 5) a technology base and testing facility to support ocean energy system development; 6) a workforce training center in support of ocean energy technology; and 7) opportunities for both first and second stage business incubation.

4.4 Center Collaboration with Other Entities

The members of the proposed Center of Excellence in Ocean Energy Technology have a proven track record of developing collaborative teams of public and private entities with the best skill sets necessary to seize opportunities for research and technology development. FAU has a strong history of obtaining both federal and state funding through collaboration of academic and research institutes that include Nova Southeastern University, University of South Florida, Harbor Branch Oceanographic Institution, and the University of Central Florida, national research labs that include the Naval Surface Warfare Center Carderock Division (NSWCCD), Center for Innovation in Ship Design, NSWCCD South Florida Testing Facility, and NSWC Panama City, and private companies such as Shell Oil, Lockheed Martin, Oceaneering International Inc., Maritime Applied Physics Corporation, Clipper Windpower, Aquantis LLC., among many others. Funding has been obtained at the federal level from many agencies, including the Office of Naval Research, the National Science Foundation, the National Oceanographic and Atmospheric Administration (NOAA), and the Department of Energy. At the state level, funding has been obtained from the Florida Department of Transportation and the Florida Department of Environmental Protection, among other state agencies.

Inclusion of Industry in an Ongoing Manner in Center Research

Using the New Academia/Industry Partnership Paradigm, the Center will by nature, consistently include, involve and collaborate with industry on research areas of interest on the core focus of the Center. One of the research advisory board's mandates, whose members include industry representatives, will be to maintain the balance between academic and industrial participation to ensure the research leadership, viability, utility, and competitiveness of the Center.

4.5 Leadership and Management

FAU has a solid track record for managing large projects with the necessary experience, policies, and systems in place to ensure that goals are met with the greatest efficiency and impact. The Center's philosophy in creating the research program is to build on existing strengths and create

a unique energy niche that will serve Florida, the nation, and the world. This is achieved with the integration of ocean engineering, renewable energy engineering, environmental science, and marine biology. Moreover, the Center's research program views commercialization as the driving force for all activities and therefore utilizes and integrates the expertise and experience of industry leaders in all aspects of the Center. The Center will have a well-designed organizational structure with appropriate skilled personnel in key positions and advisory committees positioned to guide and monitor the activities of the Center. As detailed in Section 3, the executive summary, the organizational structure consists of the Principal Offeror, a Board of Directors, a program manager and the technology commission. The technology commission consists of the principal technical personnel, a research advisory committee, the principal business person, a financial advisory committee, and the technology transfer committees. The technology commission will be composed of representatives from academia, industry, navy, and state and federal government agencies. The Center will launch immediately upon notification of award and build upon existing academic collaborations with industry and government. The Principal Offeror and the Board of Directors will oversee the implementation of the initiatives in the Center. The capital purchases will be primarily completed within the first year and remaining items will be acquired by June 2007. Training programs will also be advertised immediately upon notification of the award of the Center. It is anticipated that student and postdoctoral training programs will start in the Spring of 2007.

4.6 Leveraging Resources

COEOET's strengths are its resources, which include world leaders in the ocean engineering and renewable technologies, research equipment, facilities, and location. As previously discussed, SeaTech is FAU's oceanfront Institute for Ocean and Systems Engineering with 50,000 sq. ft. of housing research laboratories, offices, and conference rooms. In proximity is the NSWCCD's South Florida Testing Facility, which is on the south side of Port Everglades inlet in Fort Lauderdale, Florida. SFTF has housed an active, continuously operating Navy range for over 40 years and brings that extensive offshore operating expertise to the team. The SFTF range extends over 20 miles offshore and it is the only test range with simultaneous air, surface, and subsurface tracking capability with the ability to monitor surface ship, submarine, and remote systems. Included in SFTF's assets is a 15-mile offshore cable which will be the backbone of the instrument infrastructure used in the proposed testing range. Equally close by and forming the North Campus of the South Florida Ocean Measurement Center (SFOMC) of which FAU forms the South Campus, is the Nova Southeastern University Oceanographic Center. NSU OC has a fleet of small research vessel capability, ocean modeling, and marine biology assessment and related facilities and equipment. Its integral National Coral Reef Institute and Guy Harvey Research Institute well cover the range of ocean life that will need evaluation and assessment. Harbor Branch Oceanographic Institution in Ft. Pierce, Florida, will bring large fabrication facilities, large and capable offshore vessels and support equipment, and highly-experienced engineers. Although geographically distance, UCF will provide substantial resources, including the Advanced Materials Processing and Analysis Center, the Materials Characterization Facility, and the Florida Solar Energy Center, with expertise in hydrogen production & storage, and fuel cell technologies.

Proposed Matching Funds

Because the State of Florida funding for this Center is non-recurring, multiple plans are in place to ensure its sustainability.

- Ocean energy technology research is a priority for FAU and it is the subject of a federal earmark request for \$10,000,000. This funding, if received, will be used to further develop infrastructure and support efforts within the Center to develop a national ocean energy capacity.
- FAU's Department of Ocean Engineering is teaming with industrial partners to submit at least three proposals to the Florida Renewable Energy Technologies Grant Program, put in place through the Florida Renewable Energy Technologies & Efficiency Act. The Center will support each effort which can receive up to \$2,500,000 of state funding per proposal.
- Large royalty streams are expected within three to four years of the creation of the Center as evidenced in the Economic Impact Potential. These royalties will be reinvested within the Center to support future initiatives and create a level of self-sufficiency.
- The Center will be the only integrated ocean energy testing and development facility in the world. The unique capabilities of the Center will attract continuous funding through private ventures and government projects as ocean energy technology expands nationally, internationally, and into the open ocean.
- One of the main components of the Center is workforce development. The Center will continue to develop its undergraduate and graduate education and industrial training programs. This unique program will ensure a steady stream of core funding through tuition. The Center is expected to increase the FTE's generated for FAU and UCF.
- The COEOET will work with the Federal Department of Energy and the National Renewable Energy Laboratory to establish a permanent presence of DOE and NREL at the SeaTech facility. This will establish a revenue stream to the COEOET through DOE.
- To ensure the long-term viability of the Center after it receives its initial seed funding, the Center Board of Directors will establish a Center Sponsorship Program. This membership program will have fees ranging from \$18,000 to \$35,000, payable on an annual basis and an "in-kind" registry of services provided by the members of the Center.

4.7 Workforce Development

Advisory Council

The Center of Excellence in Ocean Energy Technology, working closely with business, industry, and government, will implement a workforce development plan that will meet the emerging needs of the ocean energy economic sector. The focus will be a multi-level system that integrates K-12, university undergraduate and university graduate programs to produce a workforce that meets and sustains the long-term growth of the sector. FAU's College of Engineering and Computer Science has a long history of using Advisory Council programs to provide academia and private industry with a vehicle for streamlined interaction and input into existing proposals and programs. Areas of benefit include identifying opportunities for internship and employment, establishing a curriculum for a prepared workforce, and K-12 preparation through training and educational programs. The research council will be assembled upon the creation of the Center, initially meeting monthly for the first six months, then once each quarter thereafter, the research council will be tasked with developing a workforce development plan, overseeing the plan's implementation, and updating the plan as needed.

Education and Training Plan

The aim is to enhance the education and training in ocean and renewables engineering offered by the COEOET member institutions through enhanced undergraduate and graduate curricula, direct

interaction with industry, and a hands-on approach to ocean energy systems design to provide a career path into the Florida ocean energy sector. The basic aspects of the program are: 1) applied and relevant capstone design projects for undergraduate seniors, 2) internships for undergraduates and graduates, 3) graduate education, 4) outreach to high school and undergraduate student, 5) program enhancements, and 6) career placement.

Capstone Design Projects for Undergraduate Seniors

As part of the undergraduate Ocean Engineering program at FAU, senior year students take a two semester capstone design course where they are tasked with designing an operational system that they take from concept development through engineering design, building to at-sea testing. This is a group activity where the class is tasked to design, fabricate, and test a system that satisfies a customer's needs. The educational experience of the senior design class will be enhanced as part of the COEOET through direct participation of industry personnel, who provide guidance and project review. Graduate students and faculty advisors will also be directly involved to guide the project and to help students see the benefits of graduate studies. Furthermore, industry speakers will be invited to present lectures in the Senior Design course to provide industrial input, but more importantly, to initiate the link between the students and industry.

Internships and Career Placement

The COEOET and existing ocean technology industry in Florida will provide a strong base for developing both graduate and undergraduate student internships. The COEOET and industrial partners will fund student internships for junior and senior students, as well as, graduate students to spend a term working hands-on in the ocean energy industry. Funding will include salary and, if the work site is more than 30 miles from the student's home campus, relocation and housing costs. Such internships have been proven to attract students into the industry and to help the students understand the relevance of pursuing graduate education. In parallel, utilizing the strong academic-industry partnership within the COEOET and that which already exists at FAU, companies will be able to recruit students directly through COEOET. To facilitate this initiative, a section of the COEOET website will host job postings from industrial partners and a bi-annual job fair will be held at the SeaTech campus (one in November and one in March).

Graduate Student and Post Doctoral Program

As part of the COEOET, funding (both salary and tuition) will be made available to COEOET faculty members to support graduate students and post doctoral researchers. Faculty members who wish to recruit graduate students and post doctoral students will submit a detailed proposal to the Research Advisory Committee who will rank and select the proposals to be funded. Strong emphasis will be placed on working with the industrial partners to solve real world needs and to create a clear path for graduate students and eminent scholars to pursue private-sector careers.

Curriculum Development

The Department of Ocean Engineering at FAU has several sub-disciplines within its undergraduate and graduate programs in the areas of hydrodynamics, offshore structures, corrosion and materials, composite materials, and acoustics. With the creation of the COEOET, an ocean renewable energy major will be created. At the undergraduate level, this program will include the creation of two elective courses that students will take in their senior year, to augment the current course content in hydrodynamics, oceanography, and ocean structures with ocean renewable energy topics. To create the graduate sub discipline, an additional three to four

graduate courses will be created. Many students have already expressed interest in such a curriculum enhancement and we feel that it will be very successful in attracting students from around the nation and the world.

Outreach Programs

FAU has a strong history of sponsoring outreach programs. Not only have we worked with local high school marine magnet programs, we have also hosted high school summer workshops, created dual credit earning classes (credit for high school and university), hosted a National Science Foundation-U.S. Department of Defense (NSF-DoD) sponsored Research Experience for Undergraduate (REU) site in Ocean Engineering, as well as supported public outreach efforts including public seminars, tours, and participation in public forums. The COEOET will host a summer program in ocean energy and actively participate in other aspects of outreach programs.

Past Performance

The Department of Ocean Engineering at FAU has the oldest and one of the largest ocean engineering undergraduate programs in the nation. Founded in 1965, the department has grown to two campuses, one in Boca Raton and the SeaTech Campus in Dania Beach. It currently has approximately 120 undergraduate students and 40 graduate students pursuing BS, MS, and Ph.D. degrees.

Ocean Engineering at FAU has achieved considerable success and demonstrated the utility of the aforementioned program structure. Through funding from Office of Naval Research's (ONR) National Naval Responsibility in Naval Engineering, FAU has developed a very successful program that integrates research and education to develop a workforce that meets the future needs of the US Navy. One significant accomplishment is the many internships and job placements that have been achieved. Many students graduating the program have quickly become strong contributing members to the field of Naval Engineering. Most noteworthy of the program's accomplishments is that FAU graduate and undergraduate student interns at the Naval Surface Warfare Center Carderock Division – Center for Innovation in Ship Design (NSWCCD-CISD) have investigated “game changing” concepts for Seabasing which led to an ONR Innovative Naval Prototype Program aimed at developing these systems. A Master of Science degree track in ship design has been introduced at FAU and outreach activities have included submarine workshops and summer classes for high school students and an NSF-DoD REU program aimed at minority students.

Direct Industrial Workforce Development – Ocean Engineering Executive Engineering Program

An Ocean Engineering Executive Education Program will be introduced that will enhance the decision making skills of executives from academia, business, government and civic organizations concerning ocean energy technologies, including research, educational, financial, communications, and related planning and development aspects. The objective of this new program is to educate organizational leaders regarding current practices, status and trends in ocean energy engineering so that their ability to make informed decisions is enhanced. This will be accomplished by providing a three-day executive short course that immerses them in the major facets of this subject. The course will be offered every year and, with appropriate evaluation will serve as a basis for further outreach using materials developed for this program.

5. Resumes

List of Resumes

NAME	ORGANIZATION
AN, P. Edgar	FAU, Dept. of Ocean Engineering
ANANTHAKRISHNAN, Palaniswamy	FAU, Dept. of Ocean Engineering
BEAUJEAN, Pierre-Philippe J.	FAU, Dept. of Ocean Engineering
BLACKWELDER, Patricia L.	Nova Southeastern University Oceanographic Center
BURNEY, Curtis Michael	Nova Southeastern University Oceanographic Center
BRIGGS, Douglas A.	FAU, Dept. of Ocean Engineering
COLEY, Camille E.	FAU, Division of Research
COULSON, Robert	FAU, Dept. of Ocean Engineering
DALGLEISH, Fraser Ross	Harbor Branch Oceanographic Institution
DHERE, Neelkanth G.	University of Central Florida, Florida Solar Energy Center
DHANAK, Manhar R.	FAU, Dept. of Ocean Engineering
DODGE, Richard Eugene	Nova Southeastern University Oceanographic Center
DRISCOLL, Frederick Ralph	FAU, Dept. of Ocean Engineering
FENTON, James M.	University of Central Florida, Florida Solar Energy Center
FRANKENFIELD, John Charles	FAU, Dept. of Ocean Engineering
FREY, Charles L.	Harbor Branch Oceanographic Institution
GILLIAM, David S.	Nova Southeastern University Oceanographic Center
GOLDBERGER, Gerald N.	FAU, Division of Research
GRANATA, Richard D.	FAU, Dept. of Ocean Engineering
GUSTAFSON, Thomas Francis	Nova Southeastern University Oceanographic Center
HARTT, William H.	FAU, Dept. of Ocean Engineering
HIRONS, Amy Christia	Nova Southeastern University Oceanographic Center
KEITH, Edward Oliver	Nova Southeastern University Oceanographic Center
KENNAN, Sean C.	Nova Southeastern University Oceanographic Center
KOHLER, Kevin E.	Nova Southeastern University Oceanographic Center
LEMANSKI, Larry F.	FAU, Division of Research
LINKOUS, Clovus Alan	University of Central Florida, Florida Solar Energy Center
MAHFUZ, Hassan	FAU, Dept. of Ocean Engineering
MESSING, Charles Garrett	Nova Southeastern University Oceanographic Center

MITTAL, Vishal O.	University of Central Florida, Florida Solar Energy Center
MURADOV, Nazim Z.	University of Central Florida, Florida Solar Energy Center
NAPPI, Stephen G.	FAU, Division of Research
PANTELAKIS, Thomas	FAU, Dept. of Ocean Engineering
PRESUEL-MORENO, Francisco J.	FAU, Dept. of Ocean Engineering
PURKIS, Samuel J.	Nova Southeastern University Oceanographic Center
REHAGE, Jennifer S.	Nova Southeastern University Oceanographic Center
RIEGL, Bernhard Michael	Nova Southeastern University Oceanographic Center
SHIVJI, Mohmood S.	Nova Southeastern University Oceanographic Center
SOLOVIEV, Alexander V.	Nova Southeastern University Oceanographic Center
SPIELER, Richard E.	Nova Southeastern University Oceanographic Center
T-RAISSI, Ali	University of Central Florida, Florida Solar Energy Center
THOMAS, James Darwin	Nova Southeastern University Oceanographic Center
VENEZIA, William A.	Naval Surface Warfare Center, South Florida Testing Facility
VON ELLENRIEDER, Karl	FAU, Dept. of Ocean Engineering

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
An, P. Edgar	Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 Tel: 954-924-7231 (office) 954-924-7270 (fax) Internet email address: ean@oe.fau.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR	FIELD OF STUDY
University of New Hampshire	Ph.D.	1991	Electrical Engineering
University of New Hampshire	M.S.	1988	Electrical Engineering
University of Mississippi	B.S.	1985	Electrical Engineering

PROFESSIONAL EXPERIENCE

- Professor (2005-present), Department of Ocean Engineering, Florida Atlantic University
- Associate Professor (1999-2005), Department of Ocean Engineering, Florida Atlantic University
- Visiting Professor (May 19 – July 31, 2003) at Naval Surface Warfare Center at Carderock Division, Bethesda, Maryland
- Assistant Professor (1995-1999), Department of Ocean Engineering, Florida Atlantic University
- Visiting Assistant Professor (1994-1995), Department of Ocean Engineering, Florida Atlantic University
- Post-doctoral Fellow (1991-1994), Department of Aeronautics and Astronautics at Southampton University, England
- Machine Vision Researcher (Summer of 1991), Current Technology, Durham, New Hampshire
- Research Assistant (1987-1991), Department of Electrical and Computer Engineering at the University of New Hampshire
- Teaching Assistant (1985-1987), Department of Electrical and Computer Engineering at the University of New Hampshire

RECENT PUBLICATIONS

- **An Ad Hoc Wireless Acoustic Network Simulator Applied to Multiple Underwater Vehicle Operations in Shallow Waters Using High-Frequency Acoustic Modems**, T. Carlson, P. Beaujean., E. An, (*accepted for*) Journal of Underwater Acoustics, 2006.

- **Development of a Modular Docking System for 12.75” Class Autonomous Underwater Vehicles**, R. Coulson, J. Lambiotte, E. An, *Sea Technology*, April 2005.
- **Submesoscale Coastal Ocean Flows Detected by Very High Frequency Radar and Autonomous Underwater Vehicles**, **Shay, L. K., T. M. Cook, P. E. An, J. Atmos. Oceanogr. Tech, Vol.20, No.11, pp.1583-1599, 2003.**
- **SFOMC: A Successful Navy and Academic Partnership Providing Sustained Ocean Observation Capabilities in the Florida Straits**, **Edgar An (Co-author), Marine Technology Society Journal, special issue on Ocean Observing Systems, Vol. 37, No.3, Fall 2003.**
- **Modeling and Simulation of Autonomous Underwater Vehicles: Design and Implementation**, **H. Song, E. An, A. Folleco, IEEE Transactions on Oceanic Engineering, Vol. 28, Issue: 2, pp.283-296, April 2003.**
- **Very High Frequency Radar Mapping of Surface Currents**, **L. Shay, T. Cook, H. Peters, R. Weisberg, E. An, A. Soloviev, Vol.27, No.2, pp.155-169, IEEE Transactions on Oceanic Engineering, April, 2002.**
- **Design Robust Nonlinear Controllers for Autonomous Underwater Vehicles with Comparison of Simulated and At-sea Test Data**, **Feijun Song, Edgar An, Samuel M. Smith, Journal of Vibration and Control, Vol.8, pp.189-217, 2002.**
- **An AUV Survey in the Littoral Zone: Small-scale Subsurface Variability Accompanying Synoptic Observations of Surface Currents**, **M. Dhanak, E. An, K. Holappa, IEEE Transactions of Oceanic Engineering, Vol.26, No.4, pp.752-768, October 2001.**
- **Enhancement of the Inertial Navigation System for the MORPHEUS Autonomous Underwater Vehicles**, **G. Grenon, E. An, S. Smith, A. Healey, IEEE Transactions of Oceanic Engineering, Vol.26, No.4, pp.548-560, October 2001.**

SPONSORED FUNDING SOURCE

- Office of Naval Research, National Science Foundation

AWARDS/HONORS

- Researcher of the Year Award, Associate Professor Level, Florida Atlantic University, 2003-2004.
- Dean’s Faculty Award, Associate Professor, College of Engineering, Florida Atlantic University, 2003.
- Researcher of the Year Award, Associate Professor, College of Engineering, Florida Atlantic University, 2002.
- Researcher of the Year Award, Assistant Professor Level, Florida Atlantic University, 1997-1998.
- Member of Sigma Xi, Phi Kappa Phi and Tau Beta Pi honor societies.
- University of New Hampshire Summer Graduate Fellowship, 1987.
- University of Mississippi Cum Laude Graduate, 1985.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Ananthakrishnan, Palaniswamy	Associate Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023

EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR	FIELD OF STUDY
University of California at Berkeley	Ph.D.	1991	Naval Architecture and Offshore Engineering (Hydrodynamics)
Indian Institute of Technology, Madras	B. Tech.	1983	Naval Architecture

A. Positions and Honors.

Positions and Employment

2001– present	Associate Professor, Department of Ocean Engineering, Florida Atlantic University, Boca Raton, FL 33431
1995-2000	Assistant Professor, Department of Ocean Engineering, Florida Atlantic University, Boca Raton, FL 33431
1993-1995	Visiting Assistant Professor, Department of Ocean Engineering, Florida Atlantic University, Boca Raton, FL 33431
1992-1993	Postdoctoral Fellow, Department of Naval Architecture and Offshore Engineering, University of California, Berkeley, CA 94720

B. Relevant publications.

- 1 P. Ananthakrishnan, ``Radiation hydrodynamics of a floating vertical cylinder in a viscous fluid," *Journal of Engineering Mechanics*, vol. 125, No.7, pp. 836-847, 1999.
- 2 P. Ananthakrishnan, ``Radiation hydrodynamics of a floating vertical cylinder in a viscous fluid," *Journal of Engineering Mechanics*, vol. 125, No.7, pp. 836-847, 1999.
- 3 P. Ananthakrishnan, ``Nonlinear diffraction of waves over a submerged body in a real fluid," *Proceedings of the Eighth International Offshore and Polar Engineering Conference*, Montreal, 1998.
- 4 P. Ananthakrishnan, ``Nonlinear diffraction of waves over a submerged body in a real fluid," *Proceedings of the Eighth International Offshore and Polar Engineering Conference*, Montreal, 1998.

- 5 P. Ananthkrishnan (with R. W. Yeung), "Viscosity and surface-tension effects on wave generation by a translating body," *Journal of Engineering Mathematics*, vol. 32, pp. 257--280, 1997.

C. Research Support.

Principal Investigator

1. AUV Hydrodynamics in shallow water during adverse weather conditions, Office of Naval Research, 1998-1999.
2. Application of hydrodynamics and dynamics models for efficient operation of modular mini-AUVs in shallow and very shallow waters, Office of Naval Research, 2000-2002.

Co-Principal Investigator

1. NNRNE, National Naval Responsibility Program in Naval Engineering, Office of Naval Research, 2003- 2005
2. Hydrodynamic and Dynamic Analyses of a Remotely-Piloted Unmanned Underwater Vehicles (RPUUV), Center for Coastline Security Technology, Office of Naval Research, 2005 – 2008.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Beaujean, Pierre-Philippe J.	Assistant Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Florida Atlantic University	Ph.D.	2001	Ocean Engineering
Florida Atlantic University	M.S.	1995	Ocean Engineering
Univ. de Technologie de Compiegne (France)	M.S.	1994	Mechanical Engineering
Univ. de Technologie de Compiegne (France)	B.S.	1993	Mechanical Engineering

A. Positions and Honors.

Positions and Employment

2003-present Asst. Professor, Dept. of Ocean Engineering, Florida Atlantic University
 2002 Visiting Asst. Professor, Dept. of Ocean Engineering, Florida Atlantic University
 1996-2001 Sonar Engineer, Dept. of Ocean Engineering, Florida Atlantic University
 1994-1995 Research Assistant, Dept. of Ocean Engineering, Florida Atlantic University

Honors and Awards

Research of the Year 2004-2005, College of Engineering, Florida Atlantic University
 FAU Dean's Award for Merit, 2003-2004, College of Engineering, Florida Atlantic University
 Graduate Faculty member, Fall 2005 to Fall 2010, Florida Atlantic University

B. Selected peer-reviewed publications.

P.P.J. Beaujean and J. Proteau, "Spatio-Temporal Processing Technique for High-Speed Acoustic Communications in Shallow Water at the South Florida Testing Facility, Theory and Experiment", U.S. Navy Journal of Underwater Acoustics, Jan. 2006, accepted for publication with revision, under revision.

P.P.J. Beaujean and G.J. Strutt, "Measurement of the Doppler shift in forward-scattered waves caused by moderate sea surface motion in shallow waters", Acoustical Society of America Acoustic Research Letters Online, Oct. 2005, Vol. 6, no. 4, pp. 250-256.

P.P.J. Beaujean and L.R. LeBlanc, "Adaptive Array Processing for High-Speed Communication in Shallow Water", IEEE Journal of Oceanic Engineering, July 2004, Vol. 29, no. 3, pp. 807-823.

P.P.J. Beaujean, Marianne Joussein, Steven G. Schock, "Influence of Depth-Dependent Sediment Properties on the Pressure Reflection Coefficient at Normal Incidence", U.S. Navy Journal of Underwater Acoustics, Jan. 2006, in print.

J.M. Cuschieri, E. Charmes and P.P.J. Beaujean, "Acoustic Scatter from a Submerged Target in a Waveguide", Journal of Acoustical Society of America, Accepted for Publication, to appear in Fall 2006.

F.R. Driscoll, P.P. Beaujean, W.A. Venezia, "Development and Testing of an A-Sized Rapidly Deployable Navigation and Communication GATEWAY Buoy", Marine Technology Society Journal, Vol. 40, no. 1, pp. 36-46.

E.A. Carlson, P.P.J. Beaujean and E. An, "An Ad Hoc Wireless Acoustic Network Simulator applied to Multiple Underwater Vehicle Operations in Shallow Waters using High-Frequency Acoustic Modems", U.S. Navy Journal of Underwater Acoustics, Jan. 2006, in print.

L.R. LeBlanc and P.P.J. Beaujean, "Spatio-Temporal Processing of Coherent Acoustic Communication Data in Shallow Water", IEEE Journal of Oceanic Engineering, Jan. 2000, Vol. 25, no.1, pp. 40-51.

W. Venezia, W. Baxley, P. Tatro, M. Dhanak, F. Driscoll, P.-P. Beaujean, S. Shock, S. Glegg, E. An, M. Luther, R. Weisberg, H. DeFerrari, N. Williams, H. Nguyen, N. Shay, J. Van Leer, D. Dodge, D. Gilliam, A. Soloviev, S. Pomponi, "SFOMC, A Successful Navy And Academic Partnership Providing Sustained Ocean Observation Capabilities in the Florida Straits", Marine Technology Society, Vol. 37., no.3., pp. 81-91.

C. Research Support.

Dr. Beaujean has been principal or co-principal investigator on research contracts and grants originating from the Office of Naval Research, the National Science Foundation, the Lockheed Corporation and the Naval Underwater Warfare Center.

Major Experimental Trials Using FAU Acoustic Modem

ONR AUV Fest 05, Key Port, Washington, June 2005.

ONR AUV Fest 05 Rehearsal, Panama City, Florida, May 2005.

ONR Modem Fest 02, Gulf Port, Mississippi, August 2002.

SACLANT sea acceptance test, La Spezia & Elba, Italy, February – March, 2002

ONR Modem Fest 99, Gulf Port, Mississippi, August 1999.

GOATS 2000 using OEX C, Elba, Italy, October, 2000.

ONR FBEH 2000, Ft. Lauderdale, FL, June, August, 2000.

Research Collaborators

John Spruance (EdgeTech), Frederick Jablonski (EdgeTech), Joseph Cuschieri (Lockheed-Martin), Gary Trimble (Lockheed-Martin), Lee Freitag (Woods Hole Institute of Oceanography), Anthony Healey (Naval Postgraduate School), Truon Nguyen (UCSD), William Venezia (Naval Surface Warfare Center, South Florida Testing Facility), Charles Bernstein (Naval Surface Warfare Center, Panama City), T.J. Tarn (Washington University, St Louis), Harry deFerrari (University of Miami), John van Leer (University of Miami), Alex Soloviev (Nova Southeastern).

BIOGRAPHICAL SKETCH

NAME Blackwelder, Patricia L.	POSITION TITLE Associate Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of South Carolina	PhD	1976	Geology
Duke University	MS	1970	Geology
Queens College of the City University of New York	BA	1968	Geology

CURRENT ACADEMIC RANK: Associate Professor

Secondary/ Joint Appointments:

- 1998-Present Scientific Coordinator, University of Miami Center for Advanced Microscopy (UMCAM), University of Miami
- 1986-1998 Director, RSMAS, Electron Microscopy Laboratory, University of Miami

CERTIFICATION: Professional Geologist, Florida Department of Professional Regulation (NG 0001081)

ACADEMIC EXPERIENCE:

- 1980-Present Associate Professor. Nova Southeastern Oceanographic Center
- 1998-Present Scientific Co-ordinator, University of Miami Center for Advanced Microscopy (Part-time Appointment)
- 1986-1998 Director. Electron Microscopy Facility, RSMAS, University of Miami (Part-time Appointment)
- 1978-1980 Assistant Professor, Nova Southeastern Oceanographic Center
- 1976-1978 Post Doctoral Appointment. Electron Microscopy Center, University of South Carolina.

PUBLICATIONS AND SELECTED PRESENTATION ABSTRACTS:

2006 Prince, J. Lynn, M. and **P. Blackwelder**, Study of Excretory Calcification in *Apalaysia* sp., *Journal of Molluscan Studies*, In Press.

2005 **Blackwelder, P.**, Renegar, D.A., Vargas-Angel, B., Miller, A.W., Portnoy, D.A. Dodge, R.E., Gilliam, D.S., Effects of Sedimentation Stress on Ultrastructure and Calcification in *Montastraea cavernosa*. ASLO Ocean Sciences Meeting, February 2006, Honolulu, Hawaii.

- 2005 Zarikian, C.A., Swart, P.K, Gifford, J.A., and **Blackwelder, P.L.** Holocene Paleohydrology of Little Salt Sprig, Florida, based on Ostracod Assemblages and Stable Isotopes, *Palaeogeography, Palaeoclimatology, Palaeoecology* 225, 134-156.
- 2005 Zarikian, C.A., **Blackwelder, P.L.**, Hood, T., Soter, S. and Katsonopoulou, D., Microfaunal Evidence for Paleoenvironments of the Helike Delta, In Press.
- 2004 **Blackwelder, P.L.**, Zarikian, C. A., Hood T, Featherstone, C., Proni, J., Craynock, J., Microfauna as Tracers of Sediment Transport: Ft. Pierce Dredge Spoils Sediment Study, CIMAS, University of Miami, Annual Report to NOAA 2004, 81-82.
- 2002 Nelsen, T.A., H. R. Wanless, J. H. Trefry, C.A. Alvarez Zarikian, T. Hood, **P.L. Blackwelder**, P.K. Swart, L. Tedesco, W-J. Kang, S. Metz, J., Garte, C. Featherstone, C. Souch, J. F. Pachut, M. O'Neal, and G. Ellis. Linkages between the South Florida peninsula and coastal zone: A sediment-based history of natural and anthropogenic influences. In: Karen and James Porter (Eds.) *The Everglades, Florida Bay, and Coral Reefs of the Florida Keys: An Ecosystem Sourcebook*. CRC Press. 1-1000.
- 2001 Alvarez Zarikian, C.A., Swart, P.K., Hood, T., **Blackwelder, P.L.**, Nelsen, T.A., and Featherstone, C., A century of environmental variability in Oyster Bay using ostracode ecological and isotopic data as paleoenvironmental tools. In Wardlaw, B. R. (Ed.), *Paleoecological studies of South Florida*. *Bulletins of American Paleontology*, 361, 133-143.
- 2001 Soter, S. **Blackwelder, P.L.**, Tziavos, C., Katsonopoulou, D., Hood, T. and Alvarez Zarikian, C.A.,. Environmental analysis of cores from the Helike delta, Gulf of Corinth, Greece. *Journal of Coastal Research*, 17(1): 95-106
- 1996 Levinson, H.S., Mahler, I., **Blackwelder, P.**, Hood, T. Lead resistance and sensitivity in *Staphylococcus aureus*. *FEMS Microbiology Letters*, 145, 421-425.
- 1996 **Blackwelder, P.**, Hood, T., Alvarez-Zarikian, Nelsen, T. and Mckee, B., Benthic foraminifera from the NECOP study area impacted by the Mississippi River plume and seasonal hypoxia. *Quaternary International*, vol.31, 11-36.

COLLABORATORS DURING THE LAST 48 MONTHS:

Dr. Steven Soter (American Museum of Natural History)
 Dr. Terry Nelsen (NOAA/AOML) Dr. Peter Swart (RSMAS/UM)
 Dr. Elsa Gliozzi (Rome)
 Dr. Terri Hood (RSMAS/UM)
 Dr. Hal Wanless (Geology/UM)
 PH.D Student: Carlos Alvarez Zarikian, RSMAS/UM (2004)
 Abby Renegar (NSU)

BIOGRAPHICAL SKETCH

NAME Burney, Curtis Michael	POSITION TITLE Associate Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3652 burney@nova.edu
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Rhode Island, Kingston, RI	PhD	1980	Oceanography
University of Rhode Island, Kingston, RI	MS	1976	Oceanography
Nebraska Wesleyan University, Lincoln, NB	BS	1969	Biology

PROFESSIONAL HISTORY

- 1969** Teaching and Laboratory Assistant in General Bacteriology, Biology Dept., Nebr. Wesleyan Univ.
- 1970-1974** Oceanographic Systems Technician, U.S. Navy. Honorable Discharge as Petty Officer 2nd Class.
- 1974-1977** Research Assistant, Graduate School of Oceanography, URI. NSF Project: "In-situ microbiology of dissolved organic matter cycling in the sea" Principal Investigator: J. McN. Sieburth
- 1977-1980** Research Assistant, Graduate School of Oceanography, URI. NSF Project: "Open ocean picoplankton and nanoplankton ecology and trophodynamics. PI: J. Sieburth.
- 1980-1981** Research Associate, Graduate School of Oceanography, URI.
- 1981-1988** Assistant Professor of Oceanography, Oceanographic Center, Nova University.
- 1988** Associate Professor of Oceanography, Oceanographic Center, Nova Southeastern University

GRANT HISTORY

National Science Foundation (OCE-8120622)
 "Direct In-situ Rates of Microbial Release and Uptake of Dissolved Carbohydrates" \$60,000
 National Science Foundation (renewal of OCE- 8120622) \$45,000
 Broward County, Florida Sea Turtle Conservation Project: 1989, \$34,971; 1990, \$44,389; 1991, \$44,389; 1992, \$45,000; 1993, \$56,758; 1994, \$79,569; 1995, \$56,758; 1996, \$72,589; 1997, \$79,389; 1998, \$72,589; 1998, \$72,589; 1999, \$90,773; 2000, \$90,773; 2001, \$90,773; 2002, \$124,375; 2003, \$124,375; 2004, \$124,375; 2005, \$155,704, continuing contract.
 Forman Foundation & Tindall Hammock Drainage and Irrigation District. The Potential for the Recycling and Treatment of Treated Sewage Effluent in a Deep Lime-Rock Pit Lake \$34,201
 Broward County, Florida. Hatchling Disorientation-Nest Caging Study, 1994. \$9,925

Coastal Systems International, Inc. Sea Turtle Monitoring for the Hillsboro Beach/Deerfield Beach Nourishment Project, 1998. \$1,950

Great Lakes Dredge and Dock Company: Sea Turtle Monitoring for Broward County, Florida Shoe Protection Project Segment III, 2005. \$67,842

SELECTED PUBLICATIONS

1.) Burney, C.M. 1986. Bacterial utilization of total in-situ dissolved carbohydrate in offshore waters. *Limnol. Oceanogr.* 31:427-431.

2.) Burney, C.M. 1986. Diel dissolved carbohydrate accumulations in coastal waters of South Florida, Bermuda and Oahu. *Estuarine, Coastal and Shelf Science.* 23: 197-203.

3.) Burney, C.M., C. Mattison and L. Fisher. 1991. The relationship of loggerhead nesting patterns and moon phase in Broward County, Florida. *Proceedings of the Tenth Annual Workshop on Sea Turtle Conservation and Biology, Hilton Head SC, Feb. 20-24, 1990, p.161-164. [Presentation and paper]*

4.) Burney, C.M. 1994. Seasonal and diel changes in dissolved and particulate organic matter. Chapter 5, p. 97-135 In: *The Biology of Dissolved and Particulate Organic Matter in Aquatic and Marine Systems, Second Edition, R. Wotton, ed., Lewis Press.*

5.) Margolis, W.E. and Burney, C.M. 1994. Emergence periodicity of *Caretta caretta* in Broward County, Florida. *Proceedings of the Thirteenth Annual Sea Turtle Symposium, 22-26 Feb. 1993, Jekyll Island Georgia, p 98-101. [Presentation and paper]*

6.) Dragojlovic, V. and C.M. Burney. 2000. *Experimental Organic Chemistry, A Discovery Approach. Pearson Custom Publishing, Boston MA, 169 pp.*

7) Burney, C.M. and Ouellette, S. 2006. Sea Turtle Conservation Project, Broward Co. Florida. Technical Report 2005. Broward County Environmental Protection Department, Biological Resources Division. Fort Lauderdale, Florida

8.) Ouellette, S. and C. Burney. 2006. The influence of high temperature and two hurricanes on the success of late season loggerhead nests in Broward County, Florida, in 2005. Poster presentation. 26th Annual Symposium on Sea Turtle Biology and Conservation. Island of Crete, Greece, 3-8 April 2006.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Briggs, Douglas A.	Coordinator, Research Programs Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023

EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Florida Atlantic University, Boca Raton, Florida	BS	1968	Ocean Engineering
Massachusetts Institute Of Technology, Cambridge, Massachusetts	MS	1973	Civil Engineering

a. Positions and Honors.

Department of Ocean Engineering, Florida Atlantic University, Boca Raton and Dania Beach, Florida 1998-Present

Research Engineer and Coordinator of Research Programs

Supervision and support to the technical, research, and administrative areas within Ocean Engineering. This included managing the startup and move of most of the OE graduate and research programs to the new SeaTech facility in Dania Beach, the review and recommendation of department budgets, and the management of research vessel operations including safety and the development of a separate vessel cost center. Also acted as the primary interface with the US Navy at the NSWC South Florida Testing Facility and coordinated Ocean Engineering's involvement with a collaborative partnership of government, academic, and private sector research organizations established as the South Florida Ocean Measurement Center (SFOMC). Managed the acceptance and operational startup of a 65 foot SEAL Special Operations vessel transferred to FAU from the Navy.

Applied Measurement Systems, Inc. (AMSI), Hollywood, Florida 1990-1998

Senior Engineer and Contracts Manager

As Senior Engineer at AMSI managed and supported technology development and assessment programs in underwater acoustics; design and engineering programs for the development of at-sea scientific equipment handling systems; and test and evaluation of specialized underwater equipment. Areas of new technology included the development and research of advanced towed acoustic arrays, underwater acoustic sources and hydrophone technology, the design of unique multi-cable winch systems for array deployment, and for new and innovative cable installation techniques for shore-ending fiberoptics communications cables. Also managed and participated in at-sea projects for the acquisition and analysis of acoustics

data, for submarine communication cable installations, for developing deployment and recovery plans for complex underwater systems, and in the planning and management of ship operations, mooring installations, and hydrographic surveys.

For three years acted as Contracts Manager for all of the government and commercial contracts handled by the Hollywood, Florida office. Multi-year contracts were held with the Naval Surface Warfare Center (NSWC) with tasking by individual delivery order, each of which was separately negotiated. Prime contracts were held with other government agencies and subcontracts were held with other contractors performing engineering work for the Navy. Contracts were also negotiated for equipment and services with commercial companies and for advanced underwater hardware which was delivered to foreign Navies that were approved by the US Government for technology transfer.

Tracor Marine, Inc., Fort Lauderdale, Florida 1980-1990

General Manager 1990

Managed all of Tracor Marines projects, programs, and ship operations including company owned ships which were located in both the Atlantic and Pacific oceans. In addition, Tracor Marine held multiple government contracts with the US Navy and the National Oceanic and Atmospheric Administration (NOAA). Commercial contracts included providing support to the Department of Energy (DOE) in the Marshall Islands, and to AT&T for cable laying and Sea Plow operations.

Director, Ocean Technology Division 1988-1990

Responsible for projects and programs including those involving government owned and commercially owned vessels and equipment. This included cable route surveys and cable laying, design and manufacturer of deck handling and vessel support equipment, acoustic array and range installations, and operation and maintenance of the Navy vessels OCP SEACON and R/V ERLINE. Also included was the requirement to perform scheduled vessel hull and machinery surveys, and to develop specifications for vessel repair, overhaul, and modification.

Director of Engineering and Quality Assurance 1980-1988

The Director of Engineering at Tracor Marine was responsible for all Engineering services provided by the company. Design and engineering in the areas of naval architecture, marine engineering, and facilities engineering comprised much of the work. Familiar with government mil-standards and mil-specs, US Coast Guard regulations, and classification society rules such as the American Bureau of Shipping (ABS) and Lloyds Register.

Quality assurance of company products and services was also a responsibility of the department. Both nondestructive and destructive testing techniques were employed in the fabrication of steel and aluminum products while a separate control system was in place for specifications, reports, drawings, and other software. Nondestructive testing services included testing by liquid penetrant, magnetic particle, and ultrasonics. Destructive tests were utilized to qualify welding procedures and in welder certification.

Honors and Awards

Society of Naval Architects and Marine Engineers
Member, 1975 - present

Propeller Club of the United States
Port of Port Everglades, Florida
Member, 1980 - present
American Society of Civil Engineers
Member, 1979 – present
Marine Technology Society
Member, 1975 - present
Florida Section
Vice Chairman, 1983 - 1985
Treasurer, 1990 - 1993
Chairman, 2002 – 2004
Faculty Advisor FAU Student Section 2002 - present
Boca Raton Airport Authority, Boca Raton, Florida
Authority Member, 1985 - 1987

3. Skills and Area(s) of Expertise.

Registered Professional Engineer (PE)
State of Florida (License No. 29051)
State of New Jersey (License No. 25807)
USCG Masters License for vessels to 100 tons
FAA Airline Transport Pilot and Flight Instructor Licenses

4. Research Project Support.

5. Other

Military service completed as a Commissioned Officer in NOAA with an honorable discharge. Brought up in the South Florida area and have worked throughout the United States, the Caribbean, Central America, Europe, and the Far East.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Coley, Camille E.	Executive Assistant Vice President Division of Research Florida Atlantic University

EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of VA, Charlottesville, VA		84 - 88	Chemical Eng.
Towson State University, Towson, MD	BA	89	Communications
University of Maryland, School of Law	JD	92	Law

A. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

- 91 – 93 Special Assistant to the Commission, MD Public Service Commission, Baltimore, MD
- 93 – 99 Program Administrator, State of Florida, Florida Coastal Service Commission, Tallahassee, FL
- 99 – 02 Marine Resources Specialist/Program Manager, University of Rhode Island, Coastal Resources Center, Narragansett, RI
- 02 – 05 Director, Florida Atlantic University, Division of Research and Graduate Studies, Boca Raton, FL
- 05 – present Executive Assistant Vice President, Florida Atlantic University, Division of Research and Graduate Studies, Boca Raton, FL

B. Selected peer-reviewed publications (in chronological order). Do not include publications submitted or in preparation.

C. Coley, Silvestri, Joni, Florida Assessment of Coastal Trends, Florida Dept. of Community Affairs, Florida Coastal Management Program, 1995

C. Coley, Moving Coastal Management Forward, Dec. 2000.

R. Kimbo, Coley C., J. Francs, M. Amaral and L. Hale, A Capacity Needs Assessment, 2000.

C. Research Support. List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most

relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.

N/A

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Coulson, Robert	Engineer & Coordinator of Research Programs Department of Ocean Engineering, Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Florida Atlantic University Boca Raton, Florida	M.B.A.	2003	Business Administration
Florida Atlantic University Boca Raton, Florida	M.S	1990	Ocean Engineering
Institute for Sound & Vibration Research University of Southampton, England	B.Sc.	1988	Acoustics & Vibration

D. Positions

- **1998 – Present** **Engineer & Coordinator of Research Programs**
Department of Ocean Engineering
Florida Atlantic University

- **1991 – 1994** **Engineer**
Department of Ocean Engineering
Florida Atlantic University

E. Skills and Areas of Expertise.

- **Underwater Vehicles**
- **Acoustics**
- **Mechanical/Systems Engineering**
- **Project Management**

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Dalglish, Fraser Ross	Optical Engineering Manager Engineering Division Harbor Branch Oceanographic Institution Fort Pierce, FL 34946 fdalglish@hboi.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Cranfield University (UK)	PhD	2004	Engineering
Cranfield University (UK)	MS	2001	Subsea Engineering
University of Edinburgh	BEEE	1995	Engineering

EMPLOYMENT

Optical Engineering Manager, Harbor Branch Oceanographic Institution, Oct 2005 – present

Develops research initiatives and scientific instrumentation. Responsibilities include R&D of novel technologies, testing of new methods, prototype implementation, system integration, field tests and data analysis. Project manager of an advanced underwater imaging system for the US Navy from system specification, preliminary to detailed design, modeling, production, documentation to laboratory and field testing. Duties include contractual, schedule, budget and personnel aspects as well presenting at professional conferences.

Postdoctoral Fellow, Harbor Branch Oceanographic Institution, Dec 2004 – Sept 2005

Research engineer for interdivisional collaboration to design and develop an ROV acousto-optical payload for imaging deep reef communities off South East Florida. Additional project engineering duties in the evaluation of a fluorescence-capable 3D laser imaging system.

Research Assistant, Cranfield University, Oct 2001- Oct 2004

Project responsibilities: AUV system architecture design and host software development in an industrial/governmental collaboration to develop an academic community AUV for testing novel guidance, navigation and control algorithms, and for sensor deployment. Coordination of navigation sensor integration and open water deployments for System Identification (S.I) experiments and controller testing. Producing project reports and scientific publications.

Sensor development responsibilities: Design and development of a novel laser-based optical technique for AUV navigation. Full scale evaluation of prototype system on custom designed dynamic motion mechanism.

Departmental responsibilities: Assisting Masters' level and internship students in lab- and field based work. Co-supervising Masters' theses. Presenting lectures to Masters' level students on AUV navigation and deep lake scientific research.

Diving Instructor, Diveshack Scuba School, Sliema, Malta. January - July 2000

Instructor for a dive school. Responsible for teaching diving, first aid and rescue courses to international tourists.

Divemaster, Mike Ball Dive Expeditions, Queensland, Australia. August - December 1999

Divemaster for one of the world's premier diving liveaboard operators. Responsibilities included dive guide, dive deck supervisor, zodiac operator and airport welcome party host. Worked on vessels in both Queensland and Papua New Guinea.

Programmer, Scottish Amicable, Stirling, Scotland, UK. August 1995 - February 1998

Programmer Analyst in finance industry. Part of a small team concerned with development and maintenance of PC and mainframe business systems. Responsible for small and medium scale developments and latterly involved with reengineering of business processes.

PUBLICATIONS AND INVITED TALKS

Conferences

Dalgleish, F. R., Caimi, F. M., Mazel, C. H. and Glynn, J. M. "Extended Range Underwater Optical Imaging Architecture" *To appear I MTS/IEEE Oceans 2006, September 18-21 2006, Boston, MA.*

Dalgleish, F. R., Caimi, F.M., Mazel, C.H., Glynn, J.M., Chiang, K., Giddings, T.E. and Shirron, J.J. "Model-based evaluation of pulsed lasers for an underwater laser line scan imager". *To appear in Ocean Optics XVIII. October 9-11, 2006, Montreal, Canada.*

Dalgleish, F.R., Bordner, P.R and Caimi, F.M. "HBOI extended range optical imaging test facility". *To appear in Ocean Optics XVIII. October 9-11, 2006, Montreal, Canada.*

Dalgleish, F.R., Fuchs, E and Lapointe, B.E. 2005. Remote Imaging System for Monitoring Macroalgal HABs in Deep Reef Communities off South East Florida. Presented at *3rd Symposium on Harmful Algae in the U.S.*, Oct 3-7, Monterey, CA.

Dalgleish, F.R., Naeem, W., Tetlow, S., Allwood, R. L. and Sutton, R. 2004d. Adaptive AUV Control for Optimized Swathe Laser Stripe Imaging. *Proceedings of 3rd IFAC Symposium on Mechatronic Systems*, September 6-8, Manly Beach, Sydney, Australia.

Loebis, D., Sutton, R., Chudley, J., Naeem, W., Dalgleish, F.R. and Tetlow, S. 2004c. The Application of Soft Computing Techniques to an Integrated Navigation System of an AUV. In *IFAC Symposium on Intelligent Autonomous Vehicles (IAV'04)*, July 5-7, Lisbon, Portugal.

Dalgleish, F.R., Tetlow, S. and Allwood, R. L. 2004b. A Laser-Assisted Vision Sensor for AUV Navigation. *Proceedings of 14th ISOPE conference (2004)*, vol. 2, pp. 401-408, May 23-28, Toulon, France.

Dalgleish, F.R., Tetlow, S. and Allwood, R.L. 2004a. Hammerhead: an AUV with an Integral Laser Imaging Sensor. *Oceanology 2004*, March 16-17, London, UK.

Loebis, D., Dalgleish, F.R., Sutton, R., Tetlow, S., Chudley, J., Alwood, R. 2003b. An Integrated Approach in the Design of a Navigation System for an AUV. *Proceedings of Manoeuvring and Control of Marine Crafts (MCMC '03) Conference*, pp. 329-334, September 17-19, Girona, Spain.

Dalgleish, F.R., Tetlow, S. and Allwood, R.L. 2003a. Preliminary Experiments in the Development of a Laser-Based Imaging Sensor for AUV Navigation. *Proceedings of Guidance and Control of Underwater Vehicles (GCUV) '03 conference*, pp. 239-244, April 9-11, Newport, UK.

Journals

Dalgleish, F.R., Tetlow, S. and Allwood, R.L. 2005. Vision-Based Navigation of Unmanned Underwater Vehicles: A Survey. Part Two: Vision-Based Station Keeping and Motion Estimation. To be published in *Journal of Marine Design and Operation Part B8*, 2005.

Dalgleish, F.R., Tetlow, S. and Allwood, R.L. 2004c. Vision-Based Navigation of Unmanned Underwater Vehicles: A Survey. Part One: Vision-Based Cable-, Pipeline- and Fish Tracking. *Journal of Marine Design and Operation Part B7*, December 2004, pp. 51-56.

Naeem, W., Sutton, R., Chudley, J., Dalgleish, F. R. and Tetlow, S. 2004b. A GA Based Model Predictive Control Autopilot Design and its Implementation in an Autonomous Underwater Vehicle. *Journal of Institution of Mechanical Engineering (IMEchE) Part M*, December 2004, vol. 218, no. 3, pp. 175-188(14).

Dalgleish, F.R., Tetlow, S. and Allwood, R.L. 2004a. Experiments in Laser-Assisted Visual Sensing for AUV Navigation. *Control Engineering Practice. Special issue: Guidance and Control of Underwater Vehicles*, November 2004, 12(12), pp. 1561-1573.

Book Chapter

Dalgleish, F.R. and Tetlow, S. 2005. Seabed-Relative Navigation by Structured Lighting Techniques. *Unmanned Marine Vehicles* (Roberts, G. N. and Sutton, R. (Ed)). Peter Peregrinus Ltd., Herts.

Poster

Dalgleish, F.R., Tetlow, S. and Allwood, R.L. 2002. The Design of a Laser-Based Imaging Sensor for AUV Navigation. *Institute of Physics (IoP) PHOTON 02*, September 2-3, Cardiff, UK.

Invited talks

Dalgleish, F.R., Navigation of Autonomous Underwater Vehicles (AUVs). 17th June 2004. Evening Meeting at *Royal Institution of Naval Architects (RINA)*, London, UK.

BIOGRAPHICAL SKETCH

NAME AND ADDRESS	POSITION TITLE AND ADDRESS
Dhere, Neelkanth G.	Professor, Department of Mechanical, Materials and Aerospace Engineering & Department of Electrical & Computer Engineering Program Director, Florida Solar Energy Center, University of Central Florida Phone : 321-638-1442 E-mail : dhere@fsec.ucf.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Poona, Pune, India	Ph.D.	1966	Physics
University of Poona, Pune, India	M.S.	1962	Physics, Electronics
University of Poona, Pune, India	B.S.	1960	Physics, Mathematics, Chemistry

Honors and Awards:

- Eldest Ph. D. in the Family Holding Guinness Book World Record for Most (All Five Members, Three Brothers and Two Sisters All Born to the Same Parents) Doctorates
- Fellow, AVS Science and Technology Society (2003) for Pioneering Research in Photovoltaics
- Emeritus Member, Founder-President (1979) and President (1980), Brazilian Vacuum Society,
- Chairperson-Elect, AVS Florida Chapter 2004
- Program Chairperson, Joint Symposium of the Florida Society for Microscopy, Florida Chapter of the American Vacuum Society(AVS), March 2005
- 2003 UCF Research Incentive Award
- Co-Chair, National Thin Film Module Reliability Team since 2002
- Outstanding Engineer Award 2002 – Institute of Electrical and electronic Engineers Region 3.
- Outstanding Engineer Award 2002 – IEEE Florida Council
- Outstanding Engineer Award 2002 – IEEE Cape Canaveral Section, FL
- 2001 Research Partnership Award for Outstanding Collaboration - Department of Energy, Office of Energy Efficiency and Renewable Energy's Office of Power technology, for participation in National Thin-Film Teams since their inception in 1994
- UCF Distinguished Researcher of the Year for Institutes and Centers, 2002
- FSEC Researcher of Year, 2001
- 31st IEEE Photovoltaic Specialists' Conference, Kissimmee, FL, Jan. 3-7, 2005, Invited Plenary Speaker, Co-Instructors of Two Courses on Thin Film Solar cells.
- AVS 52nd International Symposium, Anaheim, CA, Nov. 2004, Invited Speaker.

- 14th Crystalline Silicon Solar Cells Workshop, Winter Park, CO, August 8–11, 2004, Invited Speaker.
- 14th International Photovoltaic Science and Engineering Conference held at Bangkok, Thailand during January 26-30, 2004, Invited Plenary Speaker and Session Chairman, and Reviewer.
- 28th Annual Conference of the Canadian Solar Energy Society, Kingston, Ontario, Canada, Invited Key Note Plenary Speaker, 2003.
- 30st IEEE Photovoltaic Specialists' Conference, New Orleans, LA, May 2002, Co-Instructor of Two Courses on Thin Film Solar cells.
- Council of Scientific and Industrial Research (India), Junior Research Fellow, 1962-66

Appointments:

- Program Director, Florida Solar Energy Center, Cocoa, FL, May 1990 - Present
- Professor, Department of Mechanical, Materials and Aerospace Eng., University of Central Florida, Sept. 1993 - Present
- Senior Research Scientist, Solar Energy Research Institute, Golden, CO, Sept. 1986 - May 1990
- Professor, Materials Science and Engineering, Instituto Militar de Engenharia, Rio de Janeiro, Brazil, June 1971 - Sept. 1986
- Research Fellow, Comissão Nacional de Atividades Espaciais, São José dos Campos, SP, Brazil, July 1970 - June 1971
- Head, Techniques Laboratory, Physical Research Laboratory, Ahmedabad, India, Aug. 1966 - June 1970

Publications:

Five Publications Related to the Projects

1. Book Chapter: N. G. Dhere, High T_c Superconducting Thin Films, Chapter 1 in "Thin Films for Emerging Applications, Physics of Thin Films" Vol. 16, (M. H. Francombe and J. L. Vossen, eds), Academic Press, (1992), pp. 1-143, (540 references).
2. N. G. Dhere, A. A. Kadam, S. S. Kulkarni, S. M. Bet and A. H. Jahagirdar, "Large Area CIGS2 Thin Film Solar Cells on Foils: Nucleus of a Pilot Plant", Solar Energy Journal, (2004), pp. 697-703.
3. N. G. Dhere, S. R. Ghongadi, M. B. Pandit, and A. H. Jahagirdar, "CIGS2 Thin-Film Solar Cells On Flexible Foils For Space Power" Prog. Photovolt: Res. Appl. 10, (2002), pp. 407-416.
4. N. G. Dhere and R. G. Dhere, "Thin-Film Photovoltaics" J. Vac. Sci. & Technol, (A) 23 (2003) pp. 1208-1214.
5. N. G. Dhere, J. A. Turner, A. M. Fernandez, H. Mametsuka, and E. Suzuki, "Photoelectrochemical Characterization of High Ga Content CIGS2 Thin Films" Proc. Electrochemical Society 2001 Joint International Meeting San Francisco, CA, September 2 7, 2001, # 1117.

Other Significant Publications

1. N. G. Dhere and K. W. Lynn, "CuIn_{1-x}Ga_xSe₂ Thin Film Solar Cells by Two-Selenizations Process Using Se Vapor" Solar Energy Materials and Solar Cells, 41/42, 271-279, (1996).
2. N. G. Dhere, S. Kuttath, and H. R. Moutinho, "Morphology of Precursors and CuIn_{1-x}Ga_xSe₂ Thin Films Prepared by Two-Stage Selenization Process", J. Vac. Sci. & Technol. A., 13, 1078-1082 (1995).
3. N. G. Dhere, S. S. Chavan, C. A. Linkous, H. Mametsuka, and E. Suzuki, "Study of Photoelectrochemical Cells for Hydrogen Production by Water Splitting Using CIGS₂/CdS Heterojunction" Proc. Electrochemical Society 2001 Joint International Meeting San Francisco, CA, September 27, 2001, # 1093.
4. L. Weinhardt, O. Fuchs, D. Groß, G. Storch, E. Umbach, N. G. Dhere, A. A. Kadam, S. S. Kulkarni and C. Heske, "Band alignment at the CdS/Cu(In,Ga)S₂ interface in thin film solar cells", Applied Physics Letters, 86, 062109 (2005).
5. N. G. Dhere and N. R. Raravikar, "Adhesion Strength and Surface Analysis of a PV Module Deployed in Harsh Coastal Climate" Solar Energy Materials and Solar Cells, 67, (2001) pp 363-367.

Synergistic Activities:

- Installed the larger of the two University facilities in the World for preparation of photovoltaic and CuIn_{1-x}Ga_xSe_{2-y}S_y (CIGSS) cells by selenization/sulfurization; designed from first principle, built and installed vacuum deposition systems, developed photoelectrochemical cells using thin-film PV cells and RuS₂ photoanode for generation of hydrogen by splitting water; and studied module long-term exposure and sample extraction for module durability.
- Installed one of the few complete fabrication lines in the World to produce first-generation CdS/Cu₂S thin film solar cells, prepared a 30cmx30cm fully encapsulated CdS/Cu₂S minimodule during 1970-86.
- Has installed the first array of high-voltage biased PV modules in the World for the study leakage currents and electromigration under hot and humid conditions.
- Was the first in USA to prepare high T_c superconducting thin films (T_c > 80K) based on bismuth in 1988.

Collaborators & Affiliations:

Advisor: Late Dr. A. Goswami

Collaborators: Dr. Hiroaki Mametsuka, Dr. Eiji Suzuki, Dr. Kiotaka Wasa, Res Inst of Innovative Techno Earth, Kyoto, Japan, Dr. Clemens Heske, Uni Wuerzburg and Uni Nevada Las Vegas, Dr. Ernst Baur, Uni Clausthal, Germany, Dr. Gauthrin, Uni Paris and Dr. Croset, Thomson CSF at Orsay, France, Dr. Nesreen Ghaddar, American Uni Beirut.

Graduate Students: At UCF: 1) D. Waterhouse, 2) J. Santiago, 3) S. Kuttath, 4) K. Gadre, 5) K. Lynn, 6) N. Raravikar, 7) S. Kulkarni, 8) S. Chavan, 9) S. Ghongadi, 10) Mandar Pandit, 11) A. Jahagirdar, 12) V. Gade, 13) H. Patil, 14) A. Kadam, 15) S. Kulkarni, 16) S. Bet, 17) A. Pai, 18) V. Hadagali, 19) U. Avachat, 20) A. Kadam, 21) J. Shirolkar, 22) A. Kadam, During 1970-86, 13 M.S. thesis in Materials Science and Engineering under the guidance of Dr. Dhere at the Inst. Mil. Eng. (IME), Rio de Janeiro, Brazil.

BIOGRAPHICAL SKETCH

NAME AND ADDRESS	POSITION TITLE AND ADDRESS
Dhanak, Manhar R.	Department Chair, Director of SeaTech & Professor, Department of Ocean Engineering, Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004 Voice: 954 924 7242 Fax: 954 924 7270 e-mail: dhanak@oe.fau.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR	FIELD OF STUDY
University of London	PhD	1980	Applied Mathematics with emphasis on Vortex Dynamics
Imperial College, University of London	Diploma of IC	1980	Mathematics
Imperial College, University of London	B.Sc with 1 st Class Hons.	1976	Mathematics

Professional Interests

Ocean turbulence, AUV-based observations in oceanography. Coherent vortex dynamics

Employment History

July 2003 - Department Chair and Director of SeaTech, Ocean Engineering, FAU
 2005 - Member, Board of Governors, Consortium of Ocean Research and Education
 July 2003 - Member, Board of Directors, Intelligent Systems Consortium
 July 2003- Member, Board of Directors, South Florida Ocean Measurement Center
 1999 -2003 Director, Center for Hydrodynamics and Physical Oceanography, FAU
 1990 - Professor, Florida Atlantic University (Full Professor since 1996)
 1989 - 1990 Senior Research Associate, Engineering Department, University of Cambridge,
 1982 - 1989 Research Scientist, Topexpress Limited, Cambridge, UK
 1979 – 1982 SERC Post-doctoral Research Fellow Imperial College, London.
 Field of Research: Hydrodynamic Stability of channel and boundary layer flows.

Honors

FAU Research Award for 1995-96; College of Engineering Dean's Award 2003

Selected Peer-reviewed Journal Papers

- (1) *Distortion of stagnation-point flow due to cross-stream vorticity in the external flow.*
M. R. Dhanak and J T Stuart. 1995. Phil. Trans. Roy. Soc. Lond. A 350, 1-11

- (2) *The bifurcation of circular jets in cross flow.* P Huq and M. R. Dhanak. 1996. Phys. Fluids. 8, 754-763.
- (3) *The effect of streamwise pressure gradient on a corner boundary layer.* M. R. Dhanak and P W Duck. 1997. Proc Roy Soc Lond. A 453, 1793-1815.
- (4) *Coherent vortex model for surface pressure fluctuations induced by the wall region of a turbulent boundary layer.* M. R. Dhanak, A P Dowling and C Si. 1997. Phys. Fluids. 9, 2716-2731.
- (5) *Non-similarity solutions to the corner boundary layer equations and the effects of wall transpiration.* P W Duck, S R Stow and M. R. Dhanak. 1999. Journal of Fluid Mechanics. 400. 125-162.
- (6) *On turbulent skin friction reduction on a plane surface through spanwise oscillation of the surface.* M R Dhanak and C Si. 1999. Journal of Fluid Mechanics. 383. 175-195.
- (7) *An Autonomous Ocean Turbulence Measurement Platform.* M R Dhanak and K Holappa. 1999. Journal of Atmospheric and Ocean Technology, 16, 1506 - 1518.
- (8) *Boundary-layer flow along a ridge: alternatives to the Falkner-Skan solutions.* P. W. Duck, S R Stow and M. R. Dhanak. 2000 Phil. Trans. Roy. Soc. Lond. 358, 3075-3090.
- (9) *An AUV survey in the littoral zone : small-scale subsurface variability accompanying synoptic observations of surface currents.* Dhanak, M.R., An, E, Holappa, K., 2001. IEEE J. Oceanic Eng. Vol 26 (4)
- (10) *Coastal Oceanography using a small AUV.* E. An, M R Dhanak, L K Shay, S Smith and J Van Leer. 2001, Journal of Atmospheric and Ocean Technology, 18, 215-234.
- (11) *Turbulent Convection Driven by Surface Cooling in Shallow Water.* O. Zikanov, D. N. Slinn and M. R. Dhanak. 2002 Journal of Fluid Mechanics, 464, 81 - 111.
- (12) *Large-eddy simulations of wind-driven Ekman layer.* Zikanov, O., Slinn, D., and Dhanak, M. 2003. J. Fluid Mech. 495, pp. 343-368
- (13) *Adverse Weather Experiment: Subsurface Distributions of Dissipation Rate in a shallow water column in response to the passage of an atmospheric front.* Chernys, M. and M. R. Dhanak. 2006. To be submitted

Research Support

Project (Principal Investigator)	Funding Agency	Period
Active Destabilization of Coherent Vortex Flows	NSF	92-95
Surface pressure characteristics of non-equilibrium turbulent boundary layer flows.	ONR	94-97
Small-scale ocean turbulence measurement using an AUV.	ONR	94-95
Turbulence measurement in the benthic boundary layer.	ONR	96-97
Flow in a streamwise corner. Travel Grant. (With Dr P W Duck).	NATO	96-97
Turbulence measurement surveys in the convectively driven upper mixed layer and close-bottom boundary layer over a continental shelf during a storm front.	ONR	97-98
Deployment of OEX and Autosub in Scottish waters for Langmuir cell and internal wave study.	ONR	97-98
Microstructure turbulence characteristics of a shallow water column during a storm	ONR	98-99

High Reynolds number flow in a streamwise corner. Travel Grant.	NATO	98-99
Oceanographic measurement surveys using AUVs: (i) structure of the subsurface oceanic layer and the bottom boundary layer in littoral waters beneath adverse atmospheric conditions, and (ii) intense localized mixing in straits	ONR	2000
Subgrid scale modeling for LES simulation of flow in a turbulent BBL	ONR	2000-03
Oceanographic Measurement Surveys Using a Custom AUV: Mixing Induced in The Upper Mixed Layer on a Continental Shelf During Adverse Weather Conditions	ONR	2001- 05
Workshop on Establishing a Consortium of East Coast Ocean Observatories (Jointly with S E Dunn)	NSF	2001
NNRNE – Design of Mission Effective Support Ships	ONR	2003-06

BIOGRAPHICAL SKETCH

NAME Dodge, Richard Eugene	POSITION TITLE Professor and Dean, Oceanographic Center Nova Southeastern University Exec. Director, National Coral Reef Institute 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3651 voice dodge@nova.edu
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Yale University, New Haven, CT	Ph.D.	1978	Geology & Geophysics
Yale University, New Haven, CT	M.Phil.	1973	Geology & Geophysics
University of Maine, Orono, ME	B.A.	1969	Geology & Geophysics

PROFESSIONAL EXPERIENCE:

2000 – 2005	Editor, <i>Coral Reefs</i> .
1998 – present	Executive Director, National Coral Reef Institute.
1998 – present	Dean, Nova Southeastern University Oceanographic Center.
1996 – 1998	Associate Dean, Nova Southeastern University Oceanographic Center.
1994 – present	Dean, Nova Southeastern University Oceanographic Center.
1993 – present	Professor, Nova/Nova Southeastern University Oceanographic Center.
1980 – 1993	Associate Professor, Nova University Oceanographic Center.
July 1978 – 80	Assistant Professor, Nova University Oceanographic Center.
1977 – 1978	Curator Asst, Invertebrate Paleontology, Yale Peabody Museum.
Summer 1972	Benthic marine ecologic sampling in Long Island Sound, CT (Yale University).
Summer 1969	Field Asst., Glacial deposit mapping in N.W. Maine.
Fall 1968	Univ. Maine Field Asst., Expedition to Antarctica.
Summer 1968	Maine Geological Survey, Field Asst., Mapping.

GRANTS/CONTRACTS:

2004-present	World Bank GEF Reef Project, Restoration and Remediation Working Group
2003- present	Hillsboro Inlet Navigation District: Restoration and Monitoring of Injured coral reefs
2003- present	State of Florida Department of Environmental Protection and Fish and Wildlife Conservation Commission: Mapping of Southeast Florida projects; Monitoring via Southeast Florida Coral Reef Evaluation and Monitoring Project; Workshops and Technical Advisory Council for Southeast Florida Coral Reef Initiative
1998 – present	(through NOAA): National Coral Reef Institute.

- 2002-2003 Tractebel: Assessment of NG pipeline through coral reef environments (Florida & Bahamas)
- 2000 to 2001 ENRON: Assessment of NG pipeline through coral reef environments (Florida & Bahamas)
- 2000 to 2001 Navy: Baseline assessment of Vieques, Puerto Rico
- 2000 – present NSF: Paleoclimatology of West Africa and Cape Verde Islands.
- 2000 – 2001 Broward County, FL: Broward County Beach Renourishment Monitoring.
- 1997 – 2000 ONR: Coral Reef Assessment, Inventory, & Mapping.
- 1993 – 1997 Sea Grant: Coral Growth and Nutrient Records (with P. Swart, R. Halley, and L. Fisher).
- 1993 – 1996 NSF: Seasonal Coral Growth & Metabolism (with A. Szmant, P. Swart, and J. Porter).
- 1993 NSF: Survey of West Africa Coral Reefs (with Peter Swart).
- 1990 – 1994 Broward Co., FL: Hollywood-Hallandale Beach Renourishment Monitoring.
- 1990 – 1991 Port Everglades Authority: Strategic Environmental Plan.
- 1989 – 1993 USGS: Coral Climate Interactions (with Robert Halley).
- 1989 – 1992 Sea Grant: 1990 Coral Sediment Effects (with Walter Goldberg).
- 1989 – 1991 NSF: Coral Growth & Isotopes (with P. Swart & A. Szmant).
- 1987 – 1990 Broward Co., FL: J. U. Lloyd Beach Renourishment Monitoring.
- 1986 – 1995. US Navy: Flume Maintenance.
- 1986 – 1988 NSF: Plutonium and Corals.

SELECTED PUBLICATIONS:

- 2005 Fahy EA, Dodge RE, Fahy DP, Quinn TP, Gilliam DS, Spieler RE, (2005) Growth and survivorship of scleractinian coral transplants and the effectiveness of plugging coreholes in transplant donor colonies. Proc 10th Int Coral Reef Symp Okinawa, Japan June 28-July 2, 2004.
- 2005 Kohler KE, Dodge R.E. (2005). Visual_HEA: Habitat Equivalency Analysis Software to Calculate Compensatory Restoration following Natural Resource Injury. Proc 10th Int Coral Reef Symp Okinawa, Japan June 28-July 2, 2004.
- 2003 Moyer er RP, Riegl B, Banks K, Dodge RE (2003) Spatial patterns and ecology of benthic communities on a high-latitude South Florida (Broward County, USA) reef system. Coral Reefs 22(4):447-464
- 2003 Turgeon, DD, RG Asch, BD Causey, RE Dodge, W Jaap, K Banks, J. Delaney, BD Keller, R Spieler, CA Matos, JR Garcia, E Diaz, D Cantanzaro, CS Rogers, Z Hillis-Starr, R Nemeth, M Taylor, GP Schmahl, MW Miller, DA Gulko, JE Maragos, AM Friedlander, CL Hunter, RS Brainard, P Craig, RH Richmond, G Davis, J Starmer, M Trianni, P Houk, CE Birkeland, A Edward, Y Golbuu, J Gutierrez, N Ideochong, G Paulay, A Tafiëichig, and N. Vander Velde. 2002. The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2002. National Oceanic and Atmospheric Administration / National Ocean Service/National Centers for Coastal Ocean Science. Silver Spring, MD 265pp.
- 2002 Helmle, K.P., R.E. Dodge, and R.A. Ketcham Skeletal architecture and density banding in *Diploria strigosa* by x-ray computed tomography. Proceedings of 9th Int Coral Reef Symp. Bali, Indonesia Oct. 23-27 2000, Vol. 1, pp 365-371.

- 2001 Milon, J.W. and Dodge, R.E. "Applying habitat equivalency analysis for coral reef damage assessment and restoration." *Bulletin of Marine Science* 69(2): 975-988.
- 1983 Dodge, R.E., R.G. Fairbanks, L.K. Benninger, and F. Murrassa. "Pleistocene sea levels from raised coral reefs of Haiti," *Science*, 219, 1423-1425. (cover).
- 1982 Dodge, R.E., A. Logan, and A. Antonius, "Quantitative reef assessment studies in Bermuda: a comparison of methods and preliminary results," *Bull. Mar. Sci.* 32, 745-760.
- 1980 Dodge, R.E., and J.R. Vaisnys, "Skeletal growth chronologies of recent and fossil corals," chapter 14 in *Skeletal Growth: Biological Records of Environmental Change*, D.C. Rhoads and R.A. Lutz, Eds., Plenum Press, 493-517.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Driscoll, Frederick Ralph	Associate Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 954.924.7221 rdriscol@seatech.fau.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
University of Victoria, Victoria, British Columbia, Canada	Ph.D.	1999	Mechanical Engineering and Physical Oceanography
University of Victoria, Victoria, British Columbia, Canada	B. Eng	1994	Mechanical Engineering

a. **Positions and Honors.**

Positions and Employment

2006 – present Associate Professor, Department of Ocean Engineering, Florida Atlantic University, SeaTech, Dania Beach, FL, 33004, USA

2000 – 2006 Assistant Professor, Department of Ocean Engineering, Florida Atlantic University, SeaTech, Dania Beach, FL, 33004, USA

1999 – 2000 Visiting Research Professor, Department of Ocean Engineering, Florida Atlantic University, SeaTech, Dania Beach, FL, 33004, USA

1996 – 1999 President and CEO, Deep Sea Technologies Ltd., British Columbia, Canada.

Honors and Awards

Researcher of the Year, 2002 – 2003, College of Engineering, Florida Atlantic University

Researcher of the Year, 2003 – 2004, University Wide, Florida Atlantic University

b. **Selected peer-reviewed publications.**

1. F.R. Driscoll, P.P. Beaujean, and W.A. Venezia, 2006 “Development and Testing of an A-Sized Rapidly Deployable Navigation and Communication GATEWAY Buoy,” submitted to the MTS Journal, Vol. 40, 36-46
2. J. VanZwieten, F.R. Driscoll, A. Leonessa, and G. Deane, In Press 2006, “Design of a Prototype Ocean Current Turbine Part I: Mathematical Modeling and Dynamics Simulation,” Accepted for publication in the Journal of Ocean Engineering.

3. J. VanZwieten, F.R. Driscoll, A. Leonessa, and G. Deane, In Press 2006, "Design of a Prototype Ocean Current Turbine Part I: Flight Control System Development," Accepted for publication in the Journal of Ocean Engineering.
4. F.R. Driscoll, Anthony Venezia, Gabriel Alsenas, Fidel Galvan, Branka Radanovic, and Mark Selfridge, 2006, "Development and Testing of a Scale model Deep Water Stable Craneship for SeaBased Cargo Transfer", *Proceedings of the Sixteenth (2006) International Offshore and Polar Engineering Conference San Francisco, California, USA*, digital proceedings.
5. James H. VanZwieten and Frederick R. Driscoll, 2006, "A General Small Vessel Simulation Validated through Sea Trials," *Proceedings of the Sixteenth (2006) International Offshore and Polar Engineering Conference San Francisco, California, USA*, digital proceedings.
6. Buckham, F.R. Driscoll, and M. Nahon, 2004, "Development of a Finite Element Cable Model for use in Low-Tension Dynamics Simulation", *Journal of Applied Mechanics*, Vol. 71, 476-485
7. B. Buckham, F.R. Driscoll, and M. Nahon, 2004, "Three Dimensional Dynamics Simulation of Slack Tether Motion in an ROV system", *International Journal of Offshore and Polar Engineering*, Vol. 14, 218-226.
8. W. Venezia, W. Baxley, P. Tatro, M. Dhanak, F.R. Driscoll, P. Beaujean, S. Shock, S. Glegg, E. An, M. Luther, B. Weisberg, H. DeFerrari, N. Williams, H. Nguyen, N. Shay, J. Van Leer, R. Dodge, D. Gilliam, A. Soloviev, S. Pomponi, M. Crane, and K. Carter, 2003, "SFOMC, A Successful Navy And Academic Partnership Providing Sustained Ocean Observation Capabilities in the Florida Straits", *Marine Technology Society Journal*, Vol. 37, 81-91.
9. R.G. Lueck, F.R. Driscoll, M. Nahon, 2000, "A Wavelette for Predicting the Time-Domain Response of Vertically Tethered Systems," *Ocean Engineering*, Vol. 27, 1441-1453.
10. F.R. Driscoll, M. Nahon and R.G. Lueck, 2000, "A Comparison of Ship-Mounted and Cage-Mounted Passive Heave Compensation Systems," *Journal of Offshore Mechanics and Arctic Engineering*, Vol 122, 214-221.
11. F.R. Driscoll, M. Nahon and R.G. Lueck, 2000 "Development and Validation of a Lumped-Mass Dynamics Model of a Deep Sea ROV System," *Applied Ocean Research*, Vol. 22, 169-181.
12. F.R. Driscoll, R.G. Lueck and M. Nahon, 2000, "The Motion of a Deep Sea Remotely Operated Vehicle System. Part 1: Motion Observations," *Ocean Engineering*, Vol. 27, 29-56.
13. F.R. Driscoll, R.G. Lueck and M. Nahon, 2000, "The Motion of a Deep Sea Remotely Operated Vehicle System. Part 2: Analytic Model," *Ocean Engineering*, Vol. 27, 57-76.

c. Research Support.

Principal Investigator

1. Measurement and Characterization of the Velocity Structure and Variability of the Gulf Stream, Dehlsen Associates /DOE
2. Flight Control System Development for a Large Moored Ocean Current Turbine, Dehlsen Associates /DOE.
3. Enhancement of the Numerical Simulation of a Large Moored Ocean Current Turbine, Dehlsen Associates /DOE
4. Numerical Modeling and Simulation of a Large Moored Ocean Current Turbine, Dehlsen Associates /DOE
5. A Sea Base Game Changing Enabler – A Rapidly Deployable Stable Platform

6. An Interoperable Air Deployable A-Sized Gateway Navigation and Communications Buoy for Support of Littoral AUV Mission, ONR
7. REU Site: Research Experiences for Undergraduates in Ocean Engineering, NSF/DoD,
8. Continuation of the Development of a High Speed—High Accuracy Motion Measurement System & ADCP Motion Correction Algorithm for a Small, Multi-Purpose, Autonomous Surface Vessel, ONR
9. Development of an Air Deployable Self-Mooring A-Sized Navigation and Communication Buoy for Support of Littoral AUV Missions, ONR
10. Air Deployable Self-Mooring A-Sized Sensory System, ONR

Co-Principal Investigator

1. Acoustic Communication and GPS-based Long-Base Line Navigation from an A-Sized GATEWAY Buoy with Delayed/Remote Activation, Controlled through Satellite Link, using the FAU DPAM and WHOI Micro-modem for AUV Mission and Future Naval Capability Experiments, ONR
2. An Interoperable Air Deployable Self-Mooring A-Sized Gateway Navigation and Communications Buoy for Support of Littoral AUV Missions, ONR
3. Development of a Small, Multi-Purpose, Autonomous Surface Vessel, ONR
4. Forward Look Sonar and Towed Body Cable Dynamic Modeling, Lockheed Martin

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Fenton, James M.	Professor and Director Florida Solar Energy Center University of Central Florida 1679 Clearlake Rd. Cocoa, FL 32922-5703

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
University of Illinois, Urbana-Champaign	Ph.D.	1984	Chemical Engineering
University of Illinois, Urbana-Champaign	M.S.	1982	Chemical Engineering
University of California, Los Angeles	B.S.	1979	Chemical Engineering

Appointments:

2005- Director, Florida Solar Energy Center, of Univ. Central Florida
 2005- Professor, MMAE Univ. Central Florida
 1999- Associate Director, UConn's Environmental Research Institute
 1998-1999 Acting Head Chem. Engr. Dept., University of Connecticut
 1998- Professor, University of Connecticut
 1993-1999 Director, Pollution Prevention Research & Dev. Center, UCONN
 1991-1998 Associate Professor, University of Connecticut
 9/91-1995 Consultant to IBM, T. J. Watson Res. Center
 1/91-9/91 Visiting Scientist, IBM, T. J. Watson Res. Center
 1984-1991 Assistant Professor, University of Connecticut

Relevant Fuel Cell Publications:

1. Bonville, L. J., H.R. Kunz , Y. Song, A. Mientek, M. Williams, A. Ching, and J.M. Fenton. 2005. "Development and demonstration of a higher temperature PEM fuel cell stack." *Journal of Power Sources*, 144, 107 (2005).
2. Xu, H., Y. Song, H. R. Kunz and J. M. Fenton. 2005. "Effect of Elevated Temperature and Relative Humidity on Oxygen Reduction Reaction Kinetics for Proton Exchange Membrane Fuel Cells." *J. Electrochem. Soc.* 152, A1828 (2005).
3. Song, Y., J.M. Fenton, H.R. Kunz, L. J. Bonville, and M.V. Williams. 2005. "High Performance PEM Fuel Cells at Elevated Temperatures Using Nafion[®] 112 Membranes." *Journal of the Electrochemical Society*, **152**, A539 (2005).
4. Ramani, V., H. R. Kunz, J. M. Fenton. 2005. "Effect of particle size reduction on the conductivity of Nafion[®] /phosphotungstic acid composite membranes." *Journal of Membrane Science* 266:1-2, 110-114 (2005).

5. K.R. Cooper, Vijay Ramani, James M. Fenton, and H. Russell Kunz, "**Experimental Methods and Data Analyses for Polymer Electrolyte Fuel Cells**" (an experimental manual for Fuel Cell education at the University undergraduate level) copyright 2004-2005, Scribner Associates Inc., Southern Pines, North Carolina.
6. Leddy, J. and J. Fenton. 2005. "Proton Exchange Membrane Fuel Cells for Transportation Applications." The Electrochemical Society Interface, 14:3, 21(2005).
7. Williams, M.V., H.R. Kunz, and J.M. Fenton. 2005. "Analysis of Polarization Curves to Evaluate Polarization Sources in Hydrogen/Air PEM Fuel Cells." Journal of the Electrochemical Society, 152, A635 (2005).
8. Si, Y., J. -C. Lin, H. R. Kunz and J. M. Fenton. 2004. "Tri-Layer Membranes with a Methanol-Barrier Layer for DMFCs." Journal of the Electrochemical Society, 151:3, A463 (2004).
9. Williams, M.V., E. Begg, L. Bonville, H.R. Kunz, and J.M. Fenton. 2004. "Characterization of Gas Diffusion Layers for PEMFC." Journal of the Electrochemical Society, 151:8, A1173 (2004).
10. Ramani, V., H. R. Kunz, J. M. Fenton. 2005. "Stabilized Heteropolyacid/Nafion[®] Composite Membranes for Elevated Temperature / Low Relative Humidity PEFC Operation." Electrochimica Acta, 50:5, 1181 (2005).
11. Williams, M.V., H.R. Kunz, and J.M. Fenton. 2004. "Operation of Nafion[®]-based PEMFCs with No External Humidification: Influence of Operating Conditions and Gas Diffusion Layers." Journal of Power Sources, 135, 122-134 (2004).
12. Mittal, V., H. R. Kunz and J. M. Fenton. 2006. "Is H₂O₂ Involved in the Membrane Degradation Mechanism in PEMFC?" Electrochemical and Solid-State Letters, 9, A299 (2006).
13. Xu, H., Y. Song, H. R. Kunz and J. M. Fenton. 2006. "Operation of PEM fuel cells at 120–150 °C to improve CO tolerance." Journal of Power Sources, in press, corrected proof available online January 6, 2006.
14. Jiang, R., H. R. Kunz, J. M. Fenton. 2006. "Influence of temperature and relative humidity on performance and CO tolerance of PEM fuel cells with Nafion[®]-Teflon[®]-Zr(HPO₄)₂ higher temperature composite membranes." Electrochimica Acta. in press, corrected proof available online April 11, 2006.
15. V. Mittal, H. R. Kunz, J. M. Fenton. 2006. "Effect of Catalyst Properties on Membrane Degradation Rate and the Underlying Degradation Mechanism in PEMFCs." J. Electrochem. Soc., 153, A1755 (2006).

Partial List of Collaborators within last 48 months

D. Kountz, K. Raiford, M. Roelofs, D. Mah of DuPont, H. Gasteiger, M. Mathias of General Motors, A. Haug, N. Cipoline, J. Meyers, T. Skiba, T. Jarvi, L. Protsailo of UTC Fuel Cells, T. Fuller of Georgia Tech. University, H. R. Kunz, L. Bonville of UConn, V. Ramani Illinois Inst. Technology, Louie Scribner of Scribner Associates

Advisor: Fenton's Ph.D. Dissertation was supervised by Professor R. C. Alkire at the University of Illinois, 1980-1984.

Thesis Advisor and Postgraduate-Scholar Sponsor:

Fifteen students have received Ph.D.'s, twenty have received M.S. degrees and ten students have served as post-doctoral associates under Dr. Fenton's guidance.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Frankenfield, John Charles	Senior Engineer Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 franken@seatech.fau.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Florida Atlantic University	B.S.	1996	Ocean Engineering
Miami-Dade Community College	A.A.	1993	Engineering

Career History & Accomplishments

Undergraduate Laboratory Manager, *Ocean Engineering.* *Current*

- Works with multiple engineering departments to insure that required laboratory apparatus are in working condition and available to the classes requiring them.
- Researches and helps design new experiments to provide a more hands on experience in the lab..
- Provides support for outreach programs hosted at the Dania Beach and Boca Raton Campuses including the Engineering Scholars Program..

Mechanical Design Consultant, Mechanical Group, *Ocean Engineering* *Current*

- Provides mechanical design and fabrication support for Senior Design and Sponsored Research from the Dania beach Campus.
- Working toward establishing an inventory of tools and references that will allow a wide range of projects to be conducted efficiently.
- Provides auxiliary instruction in solid modeling, fabrication and documentation.

Mechanical Design Consultant, Air Deployable Buoy, *Ocean Engineering* 2004-2005

- Provided design support for the redesign of the self moored buoy to fit into the allowed package volume.
- Explored alternative methods for releasing the component sections after water entry.
- Explored methods to improve orientation control during descent and water entry.

Chief Mechanical Designer of the OEX-C class AUVs, *Ocean Engineering* 2002-2003

- Worked with Perry-Slingsby to devise a new low labor interface for the vehicle battery packs.
- Worked with Innovative Metal Technologies to construct a more robust thrust and control module
- Was responsible for final assembly and mechanical support during testing conducted in the United States.

Memberships & Affiliations

- Member, Boy Scouts of America
- Member, Tau Beta Pi, Engineering Honor Society
- Member, Phi Theta Kappa, Honor Society of Two year Colleges
- Member, FAU Dive Club

Summary

- Demonstrated achiever with exceptional knowledge of international markets, business practices, and trade regulations.
- Strong marketing and finance background combined with fluency in several languages, including “Advanced Level” U.S. State Department certification in Russian Language Reading Comprehension.
- Skilled at learning new concepts quickly, working well under pressure, and communicating ideas clearly and effectively.
- Extensive computer training, including knowledge of multiple networking environments and business software packages.
- Enthusiastic and experienced in overseas travel.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Frey, Charles L.	Senior Ocean Engineer Center for Ocean Exploration Harbor Branch Oceanographic Institution 5600 US Hwy 1 North Fort Pierce, FL 34946 lfrey@hboi.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Univ. of Wyoming, Laramie, EY	PhD	Pursuing	Robotics
Florida Institute of Technology, Melbourne, FL	M.S.	2002	Ocean Engineering
Florida Institute of Technology, Melbourne, FL	B.S.	1999	Ocean Engineering

ACADEMIC POSITIONS Adjunct Professor of Ocean Engineering, **Florida Institute of Technology** (2005 – Present)

Sr. Ocean Engineer and Principal Investigator, **Harbor Branch Ocean. Inst.**, (2004 – Present)

Research Assistant in Electrical Engineering, **University of Wyoming** (2005)

Research Assistant in Ocean Engineering, **Florida Institute of Technology** (2000-2002)

PROFESSIONAL EXPERIENCE

03/02 – Present Sr. Ocean Engineer and Principal Investigator – ***Harbor Branch Oceanographic Institution (HBOI)***,

Center for Ocean Exploration, Ft. Pierce FL.

- Function as lead engineer, principal investigator, and project manager for various research and development projects.

- **Recent Projects:**

- o ***HIDEX Gen III Bathyphotometer*** – Served as lead engineer, software developer, and project manager on Office of Naval Research (ONR) funded bioluminescence measurement instrument. The result is the most sensitive and sophisticated bioluminescence research tool in the world. The system is currently operating in regular monthly field expeditions off of the Florida coast. Additional research & development is ongoing.

- o ***Eye-In-The-Sea & Eye-In-The-Sea on MARS*** – Served as lead engineer, software developer, and project manager on two National Science Foundation (NSF) funded projects to develop an unobtrusive, exploratory deep-ocean video monitoring system. The first unit was designed to be autonomous and has been field tested extensively, deployed from the HBOI JSL submersibles as well as the MBARI Ventana ROV. Several recorded species still remain unidentified. The second system is currently under development for the MBARI MARS cabled observatory in Monterey Bay, CA.

o *Nemesis ROV* – Developed Ethernet-based telemetry & control system for 50HP custom built electric/hydraulic rescue-class Remotely Operated Robotic Vehicle for use in the offshore oil industry. System is currently operated by Deep Marine Technology (DMT) in the Gulf of Mexico.

o *LoLAR II* – Development of the Low Light Auto-calibrating Radiometer, an extremely sensitive optical instrument used to measure downwelling of light in the ocean as well as various bioluminescent phenomena. The project was funded by NSF and ONR.

o *HIDEX Gen II Bathyphotometer* – Served as lead software engineer for second-generation development of the High-Intake Defined-Excitation Bathyphotometer, a bioluminescence measurement instrument funded by the Naval Oceanographic Office. System is currently in use by NAVO.

08/02 – 12/02 Engineering Co-Op – *Rockwell Collins, Inc.*, Melbourne, FL.

- Co-Op engineering work assessing manufacturing processes and testing for aircraft electronics

08/00 – 12/02 Graduate Research Assistant – *Florida Institute of Technology*, Melbourne, FL.

- Paid thesis research and management of the FIT Underwater Technologies Laboratory

06/99 – 01/01 Software Engineer - *Presideo, Inc.* (formerly *Integrated Visions, Inc.*), Sebastian, FL.

- Software/Hardware Development for Biometric Authentication & Internet Security (using fingerprint,

iris, facial, and handprint recognition technologies)

- Majority of clients were within the medical industry, moving towards HIPAA compliance.

- Programmed in C/C++ (using the Win32 API, MFC, STL), Java (applets & servlets, using JNI, AWT,

Swing), CORBA/IDL, HTML, JavaScript.

- Familiarity with PKI using PKCS12 Certificates, MD5 hashing, & the RSA encryption algorithm.

09/96 – 12/96 Engineering Co-Op – *US Army Corps of Engineers, CERC Field Research Facility*, Duck, NC

- Coastal surveying using RTK Differential GPS and HYPACK with the CRAB crawling vehicle

- Video Image Processing and Time Series data analysis of coastal wave action

- Oceanographic instrumentation calibration & field deployment (current meters, CTDs, etc.)

RESEARCH EXPEDITIONS

16 research expeditions, 12 as lead engineer, to the Gulf of Maine, Gulf of Mexico, and the Atlantic Ocean between the

Florida Coast and the Bahamas. 2 dives logged to 2000 ft. deep in the Johnson-Sea-Link I Submersible. Also holds

NAUI & PADI advanced SCUBA diver and ASA sailing certifications.

PROFESSIONAL SOCIETIES

- Marine Technology Society (MTS)

- IEEE Oceanic Engineering Society

- Tau Beta Pi

PUBLICATIONS

Widder, E.A., D.C. Smith, C.L. Frey and E. Raymond (in prep) Eye-In-The-Sea: a deep sea observatory for

unobtrusive observations. **Biol. Bull.**

Davis, J.W., Thosteson, E.D., Widder, E.A, & C.L. Frey (in press). Examination of Bioluminescent Excitation Response using Empirical Orthogonal Function Analysis. **MTS/IEEE Oceans 2005**.
Widder, E.A., C.L. Frey and J.R. Bowers (2005) Improved bioluminescence measurement instrument. **Sea Technology** 46(2): 10-16
Widder, E.A., C.L. Frey and L.J. Borne (2003) HIDEX Generation II: A New and Improved Instrument for Measuring Marine Bioluminescence. **Marine Technology Society of the IEEE, Oceans** 4:2214-2221
Frey, C.L and S.L. Wood (2003) Development of an Autonomous Underwater Vehicle for Sub-Ice Environmental Monitoring in Prudhoe Bay, Alaska. **Marine Technology Society of the IEEE, Oceans** 2:1161-1173
Frey, Charles L. Development of an Autonomous Underwater Vehicle for Sub-Ice Environmental Monitoring in Prudhoe Bay, Alaska. Master's Thesis, **Florida Institute of Technology**, 2002.
Public Outreach:
Little, Jane B. "Eye In The Sea". **Popular Mechanics**, May 2006: 40-43.
2005 Operation Deep Scope II, posts on NOAA's Ocean Explorer Webpage
http://oceanexplorer.noaa.gov/explorations/05deepscope/background/explorers/explorers.html#explorer_6
<http://oceanexplorer.noaa.gov/explorations/05deepscope/logs/aug31/aug31.html>
2005 Operation Deep Scope II, post on HBOI's At-Sea Webpage
<http://www.at-sea.org/missions/deepscope2/day10.html>
2005 FIT DMES Lecture Series – Speaker
2003 HBOI Ocean Science Lecture Series - Speaker

BIOGRAPHICAL SKETCH

NAME Gilliam, David S.	POSITION TITLE Associate Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Nova Southeastern University, Oceanographic Center	PhD	1999	Ocean Sciences
Nova Southeastern University, Oceanographic Center	MS	1992	Marine Biology
University of Miami	BS	1988	Marine Science & Biology

A. Appointments:

2004 – pres.	Navigator –SE Florida Coral Reef Initiative
2003 – pres.	Coral Advisory Panel, South Atlantic Fisheries Management Council
1999 – pres.	Chairman Diving Control Board, NSU OC
1998 – 2006	Research Scientist, National Coral Reef Institute (NCRI), NSU OC
1998 – pres.	Adjunct Professor, NSUOC
1992 – 1998	Research Assistant, NSUOC

B. Grants and Contracts:

2006	Principal investigator: Florida Reef Resilience survey in Broward County: The Nature Conservancy
2006	Principal investigator: Hillsboro outfall assessment: Hazen & Sawyer, PO.
2006 –Current	Principal investigator: Reef Assessment: Emerald Bay Club, Great Exuma Bahamas. Coastal Systems International.
2005-Current	Principal investigator: Use of Coral Nursery Colonies for Restoration of the Alam Senang Grounding: Florida Fish and Wildlife Commission, Florida Wildlife Research Institute.
2005-Current	Co-Principal investigator: Monitoring of Initially Restored Corals and Coral Reef Mitigation Study, Broward County, Florida: Hillsboro Inlet District
2005-Current	Principal investigator: Broward County mooring buoy effectiveness study. Broward County Board of County Commissioners, Florida
2003-Current	Principal investigator: Southeast Florida Coral Reef Monitoring Program (SECREMP): Florida Fish and Wildlife Commission, Florida Wildlife Research Institute.
2003-Current	Project manager: Tractebel LNG Pipeline Benthic Surveys and Monitoring: Ft Lauderdale, FL: URS Corp.

- 2003-2005 Project manager: Hollywood outfall stony coral transplantation monitoring: Hazen & Sawyer, PO.
- 2003-2004 Project manager: Tractebel LNG Pipeline Benthic Surveys: Great Bahama Island, Bahamas: Ecology and Environment, Inc.
- 2002-2003 Project manager: Hillsboro Inlet dredging reef injury assessment and restoration, Broward County, Florida: Hillsboro Inlet District
- 2002 Project manager: *Lagniappe II* grounding assessment and restoration, Boca Chica Key, Florida Keys: Houck, Hamilton and Anderson, P. A (Responsible Party)
- 2002 Project scientist: *MSC Diego* grounding assessment and monitoring, Dry Tortugas, Florida: Houck, Hamilton and Anderson, P. A (Responsible Party)
- 2000-Current Principal investigator: Establishing stony coral “nurseries” for reef fishery habitat restoration: National Fish and Wildlife Foundation.
- 2000-Current Project manager: Marine biological monitoring in Broward County: Broward County Board of County Commissioners, Florida
- 2002 Project manager: Hollywood outfall armor rock and mat coral survey; coral transplantation monitoring: Hazen & Sawyer, PO.
- 2001-2002 Project manager: Post-Baseline Monitoring and Assessment of Coral Reattachment Success and Coral Recruitment, at the *C/V Hind* Grounding Site, Broward County Florida: Florida Fish and Wildlife Conservation Commission.
- 2001-2002 Project manager: Reef Ecosystem Baseline Assessment Survey and Monitoring, Vieques Island, Naval Station Roosevelt Roads, Puerto Rico. Geo-Marine, Inc.
- 2000 Project manager: Benthic habitat assessment within the footprint of the proposed Navy fleet mooring site, St. Croix, USVI.: EG&G Technical Services, Inc.
- 2000 Project manager: Assessment of coral reattachment success and coral recruitment at the *C/V Hind* grounding site, Broward County Florida: Florida Fish and Wildlife Conservation Commission.
- 1999 Project scientist: Coral monitoring study of transplants on a sewer outfall: Hazen & Sawyer, PO.
- 1999 Project manager: St. Croix, USVI US Navy mobile shallow range site environmental evaluation: EG&G Technical Services, Inc.

C. Publications:

- Monty, J.A., Gilliam, D.S, Banks, K., Stout, D. and Dodge, R.E. 2005. Coral of Opportunity Survivorship and the Use of Coral Nurseries in Coral Reef Restoration. Proceedings of the 10th International Coral Reef Symp., Okinawa, Japan.
- Fahy, E.G., Quinn, T.P., Fahy, D.P., Dodge, R.E., Spieler, R.E., and Gilliam, D.S. 2005. Growth and Survivorship of *Meandrina meandrites* and *Montastrea cavernosa* Coral Core Transplants and Effectiveness of Plugging Core Holes in Transplant Donor Colonies. Proceedings of the 10th International Coral Reef Symp., Okinawa, Japan.
- Gilliam, D.S., R.E. Spieler, L.K.B. Jordan, J.A. Monty, L. Fisher, K. Banks, R.E. Dodge. 2004. Long-Term Monitoring of Coral Communities and Reef Fish Assemblages off southeast Florida, USA. Proceedings of the American Academy of Underwater Sciences 23rd Annual Scientific Diving Symposium, Long Beach, CA.
- Feingold, J.S., S.L. Thornton, K.W. Banks, N.J. Gasman, D.S. Gilliam, P. Fletcher, and C. Avila. 2003. A rapid assessment of coral reefs near Hopetown, Abaco Islands, Bahamas (stony corals and algae). Pp. 58-75 in J.C. (ed), Status of Coral Reefs in the western Atlantic:

results of initial Surveys, Atlantic and Gulf Rapid Reef Assessment (AGRRA) Program. Atoll Research Bulletin 496.

- Jordan, L.K.B., D.S. Gilliam, R.L. Sherman, P.T. Arena, F.M. Harttung, R. Baron, and R.E. Spieler. 2002. Spatial and temporal recruitment patterns of juvenile grunts (*Haemulon* spp.) in South Florida. Proc. 55th Annual Gulf and Caribbean Fisheries Institute Meeting, Xel-Ha, Mexico.
- Thornton, S.L., D.S. Gilliam, R.E. Dodge, R.E. Fergen, and P. Cooke. 2002. Success and growth of corals transplanted to cement armor mat tiles in Southeast Florida: Implications for reef restoration. Proc. 9th International Coral Reef Symp. (ICRS), Bali, Indonesia.
- Sherman, R.L., D.S. Gilliam, and R.E. Spieler. 2001. Site-dependent differences in artificial reef function: Implications for coral reef restoration. *Bulletin of Marine Science* 69(2): 1053-1056.
- Spieler, R.E., D.S. Gilliam, and R.L. Sherman. 2001. Artificial substrate and coral reef restoration: What do we need to know to know what we need. *Bulletin of Marine Science* 69(2): 1013-1030.
- Dodge, R.E., D.S. Gilliam, S. Narumalani, and J. Maeder. Integration of *In Situ* Data and High-Resolution Aerial Photography for Coral Reef Mapping. Abs Oceanology International, April 3-5, 2001, Miami, Florida, USA
- Sherman, R.L., D.S. Gilliam, and R.E. Spieler. Effects of refuge size and complexity on recruitment and fish assemblage formation on small artificial reef. 52nd Annual Meeting of the Proc. Gulf Caribb. Fish. Instit. November 1-5, 1999. Key West, Florida. USA.
- Sherman, R.L., D.S. Gilliam, and R.E. Spieler. 1999. Differences in length estimates in fish census data among experienced researchers. Proceedings of the 1st International Workshop on Fish Visual Census in Marine Protected Areas. *Naturalista sicil. (Sicilian Naturalist)* Vol. XXIII (Suppl.), 289-293.
- Sherman, R.L., D.S. Gilliam, and R.E. Spieler. 1999. A preliminary examination of depth associated spatial variation in fish assemblages on small artificial reefs. *Journal of Applied Ichthyology* 15 (3): 116-122.
- Spieler, R.E., D.S. Gilliam, R.L. Sherman, K. Banks, C. Corbett-Elder, and L.K.B. Jordan. 1999. Artificial Reef Research in Broward County: The Last Six Years. IN: Florida Artificial Reef Summit '98. W. Horn (Ed.). Florida Department of Environmental Protection. pp. 60-68.
- Gilliam, D.S., R.L. Sherman, K. Banks, and R.E. Spieler. 1998. Artificial reef studies of Broward County. IN: Florida Artificial Reef Summit '98. Horn, W.(Ed.) Florida Department of Environmental Protection.
- Sherman, R.L. and D.S. Gilliam. 1996. Hepato-somatic indices and lifestyles in some batoid elasmobranchs. *Florida Scientist* 59(4):275-278
- Gilliam, D.S., K. Banks, and R.E. Spieler. 1995. Evaluation of a novel material for artificial reef construction. ECOSSET '95, Proceedings of the International conference on ecological system enhancement technology for aquatic environments. Vol. I: 345-350.
- Gilliam, D.S. and Sullivan, K.M. 1993. Diet and foraging habits of the southern stingray, *Dasyatis americana*, in tropical marine habitats. *Bulletin of Marine Science* 52(3): 1007-1013.

BIOGRAPHICAL SKETCH

NAME Gerald N. Goldberger	POSITION TITLE Assistant V.P. for Research and Director, Sponsored Research		
eRA COMMONS USER NAME ggoldber			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of Connecticut, Storrs, CT	Ph.D.	1971	Physics
University of Connecticut, Storrs, CT	M.S.	1966	Physics
Hofstra University, New York	B.S.	1964	Physics

Positions and Employment

July 1995 - Present

Assistant Vice President for Research (2004) and Director, Office of Sponsored Research, Division of Research and Graduate Studies, Florida Atlantic University, Boca Raton, Florida; Associate Professor, Department of Physics.

October 1993 - June 1995

Senior Managing Director, Office of Research and Sponsored Programs, Northwestern University, Evanston, Illinois.

April 1989 - September 1993

Director, Research Services Administration, Northwestern University, Evanston, Illinois.

September 1988 - August 1992

Associate Dean, The Graduate School, Northwestern University, Chicago, Illinois.

November 1984 - March 1989

Assistant Director, Office of Research and Sponsored Programs, Northwestern University, Evanston, Illinois.

September 1981 - November 1984

Senior Professional Associate, University of Kentucky Research Foundation, University of Kentucky, Lexington, Kentucky.

July 1978 - August 1981

Acting Head, Medical Center Branch, University of Kentucky Research Foundation, University of Kentucky, Lexington, Kentucky.

November 1975 - July 1978

Professional Associate, University of Kentucky Research Foundation, University of Kentucky, Lexington, Kentucky.

August 1971 - November 1975

Assistant Professor, Department of Physics, University of Wisconsin - Oshkosh, Oshkosh, Wisconsin.

January 1964 - August 1971

Research and Teaching Assistant, Department of Physics, University of Connecticut, Storrs, Connecticut.

Professional Memberships

Sigma Pi Sigma (Physics Honor Society), Member
American Physical Society, Member
American Institute of Physics, Member
American Association for the Advancement of Science, Member
National Council of University Research Administrators, Member
Society of Research Administrators, Member
Sigma Xi, Secretary/Treasurer (1987-2002, Northwestern Univ. and FAU)
Illinois Society for Medical Research, President (1989-92)
American Association for Laboratory Animal Science, Member
Federal Demonstration Partnership, Member
Applied Research Ethics National Association, Member
Public Responsibility in Medicine and Research, Member

Selected Peer-Reviewed Publications

Goldberger, G.N. Spin resonance studies of defect centers in ionic crystals. Dissertation, University of Connecticut, Storrs, Connecticut, c1971. 84p.

Goldberger, G.N. and Owens, F.J. Study of the thermal kinetics of the F'-to-F conversion in KCl by electron spin resonance. Phys. Rev. 4(11): 3927-3931, December 1, 1971

Kadaba, P.K., Bhagat, P.K. and Goldberger, G.N., Application of microwave spectroscopy for simultaneous detection of toxic constituents in tobacco smoke. Bull. Environ. Contam. Tox. 19(2): 104-112, Feb. 1978.

Papers Presented

Goldberger, G.N., Spin immunoassay for rapid analysis of opiates in biological fluids. Technical report prepared for Theda Clark Memorial Hospital and Mercy Medical Center. Oshkosh, Wisconsin: University of Wisconsin - Oshkosh, Sept. 1973. 7p.

Goldberger, G.N., Kadaba, P.K., and Bhagat, P.K., Application of microwave spectroscopy for identification of toxic gases in a mixture. Presented at the Southeastern Section of the American Physical Society, November 22, 1977 in Miami Beach, Florida.

Beach, J.L. and Goldberger, G.N., Fast neutrons (probably) don't kill tumors. Presented at the Great Lakes Chapter of the American Association of Physicists in Medicine, April 25-29, 1983 in Dearborn, Michigan.

Research Support

ESR Line Shape Studies of Radiation-induced Defects in Potassium Azide and Spin Immunoassay for Rapid Analysis of Commonly Abused Drugs in Biological Fluids. University of Wisconsin - Oshkosh. UW-O Faculty Research Development Grants 1971 – 1975 \$9,505

Electron Spin Resonance Spectra of Cancer Tissue. University of Wisconsin - Oshkosh. United Fund of Oshkosh 1974 – 1976 \$16,072

Sensitive Physical Method for Rapid and Direct Quantitative Measurements of Certain Tobacco Smoke Constituents. Co-Investigators: P.K. Bhagat and P.K. Kadaba. University of Kentucky. Kentucky Tobacco and Health Institute 1977 – 1978 \$38,608

Minority High School Student Research Apprentice Program, 2 SO3 RR03044 (-07-10). Northwestern University. National Institutes of Health 1989-1993 \$106,500

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Granata, Richard D.	Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 rgranata@seatech.fau.edu 954.924.7237

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
The American University, Washington, D.C.	Ph.D.	1977	Chemistry
The American University, Washington, D.C.	B.S.	1972	Chemistry

A. Positions and Honors.

Positions and Employment

1999 – present	Professor, Department of Ocean Engineering, Florida Atlantic University, SeaTech, Dania Beach, FL, 33004, USA
1999 – 2001	Visiting Research Scientist, Lehigh University, Zettlemoyer Center for Surface Studies, 7 Asa Drive, Bethlehem, PA 18015, USA
1990 – 1999	Director, Corrosion Laboratory, Lehigh University, Zettlemoyer Center for Surface Studies, 7 Asa Drive, Bethlehem, PA 18015, USA
1990 – 1991	Adjunct Professor of Chemistry, Lehigh University, Zettlemoyer Center for Surface Studies, 7 Asa Drive, Bethlehem, PA 18015, USA
1989 – 1998	Senior Research Scientist, Lehigh University, Zettlemoyer Center for Surface Studies, 7 Asa Drive, Bethlehem, PA 18015, USA
1982 – 1989	Associate Director, Corrosion Laboratory, Lehigh University, Zettlemoyer Center for Surface Studies, 7 Asa Drive, Bethlehem, PA 18015, USA
1979 – 1989	Research Scientist, Lehigh University, Zettlemoyer Center for Surface Studies, 7 Asa Drive, Bethlehem, PA 18015, USA
1977 – 1979	Research Scientist, Carnegie-Mellon Institute of Research, 4400 Fifth Avenue, Pittsburgh, PA 15213, USA

B. Selected peer-reviewed publications.

1. M.M. Madani, H.L. Vedage and R.D. Granata, "Evaluation of Polyimide Coatings Integrity by Positron Annihilation Lifetime Spectroscopy and Electrochemical Impedance Spectroscopy," *J. Electrochem. Soc.*, 144 (9), 3293-7 (1997).
2. M.M. Madani, R.R. Miron and R.D. Granata, "PALS Free Volume Study of Dry and Water Saturated Epoxies," *J. Coatings Technol.*, 69 (872), 45-54 (1997).
3. M.M. Madani, R.R. Kodnani and R.D. Granata, "Electrochemical Impedance Spectroscopy Study of Encapsulated Triple Tracks Test (TTT) Circuits," *IEEE Transactions on Reliability*, Vol. 46 (1), 45-55 (March, 1997).
4. M.M. Madani and R.D. Granata, "Positron Backscattering in Polymer/Metal Systems," *J. Appl. Phys.*, Vol. 80 (5), 2555 (1996).
5. M.M. Madani, R.C. MacQueen and R.D. Granata, "Positron Annihilation Lifetimes Study of PTFE/Silica Composites," *J. Polym. Sci., Part B*, Vol. 34, 2767 (1996).
6. R.D. Granata, J.C. Wilson and J.W. Fisher, "Assessing Corrosion on Steel Structures Using Corrosion Coulometer," *Journal of Infrastructure Systems*, 2 (3), 139 (1996).
7. R.C. MacQueen, R.R. Miron and R.D. Granata, "A Method for Corrosion Inhibition Mechanism Studies in Epoxy Coated Aluminum," *Journal of Coatings Technology*, 68 (857), 75-82 (1996).
8. R.D. Granata, J.W. Fisher, J.C. Wilson, "Update on Applications of Corrosion Coulometers," *CORROSION'97 Conference*, Paper 97307, NACE International, Houston, TX (1997).
9. R.D. Granata and M.M. Madani, "Characterization of Corrosion Products and Corrosion Mechanisms on Automotive Coated Steels Subjected to Field and Laboratory Exposure Tests," *SAE International Congress and Exposition*, Paper No. 970736, SAE (1997).
10. R.D. Granata and K.W. Tiedge, "Electrochemical Appraisal of Conformal Coatings Used in Electronic Applications," *CORROSION'92 Conference*, NACE, Paper No. 92/469 (1992).
11. R.D. Granata, W.D. Michalerya, R.H. Wildt, H. Leidheiser, Jr., B.W. O'Malley, Jr., "Quantitative Evaluation of Steel Corrosion in Microenvironments using the Corrosion Coulometer," *Review of Progress in Quantitative Nondestructive Evaluation*, Vol. 11, D.O. Thompson and D.E. Chimenti, Eds., Plenum Press, New York, 1183-90 (1992).

C. Research Support

Principal Investigator

- Integrity of Infrastructure Materials and Structures. FHWA

- Durability of Composite Materials and Structures, ONR
- Research Synthesis and Recommendations for Corrugated High Density Polyethylene Pipe, FDOT
- Smart Coatings Survey, Shell International Exploration and Production, Inc.
- Passive Electrochemical Signature Control of Special Hull Treatments (SHT),” NUWC/ONR
- Electrical Measurements of Coatings Under Hydrostatic Pressure,” NUWC/ONR

Co-Principal Investigator

- REU Site: Research Experiences for Undergraduates in Ocean Engineering, NSF/DoD,
- Center for Coastline Security Technology, ONR
- Mechanism of Al Alloy Corrosion and the Role of Chromate Inhibitors,” AFOSR

BIOGRAPHICAL SKETCH

NAME Gustafson, Thomas Francis	POSITION TITLE Director of Government Relations, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Florida, Gainesville, Florida, USA	J.D.	1974	Law
Notre Dame, South Bend, Indiana, USA	B. A & S	1971	General Program/History of Science

Positions and Honors.

Positions and Employment

2004 – present Director of Government Relations, Institute of Government and Public Policy and the Oceanographic Center, Nova Southeastern University, Fort Lauderdale/Dania Beach, FL, 33004, USA

1974 – 2004 Attorney and Partner, Gustafson Law Firm, et. al., Fort Lauderdale, FL, 33301, USA

1976 – 1990 State Representative, Florida House of Representatives, Tallahassee, FL, 32306, USA

Honors and Awards

Speaker of the House, 1988 – 1990, Florida House of Representatives

Chairman, Criminal Justice Committee, 1986 – 1988, Florida House of Representatives

Chairman, Health and Insurance Committee, 1984 – 1986, Florida House of Representatives

Chairman, Transportation Committee, 1982 – 1984, Florida House of Representatives

Chairman, Insurance Committee, 1980 – 1982, Florida House of Representatives

Majority Whip, 1978 – 1980, Florida House of Representatives

Selected peer-reviewed publications.

Florida Insurance Code, 1982

Florida Transportation Code, 1984

Medical Malpractice Reform Act of 1985

Florida Tort Reform Act of 1985

Omnibus Criminal Justice Acts of 1987 and 1988

Florida Constitution, Section 4. (e) public meetings as enacted in 1990.

Research Support.

Principal Investigator

Miami At Midnight, Miami CRA, 2004

RAC Sub-area Mobility Study for Downtown Broward – Phase I Concept Plan, Fort Lauderdale DDA (acting as DDA Project Manager), 2003

Moving in all the Right Directions, Nova Southeastern University, 2001

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Hartt, William H.	Professor of Ocean Engineering and Director of Center for Marine Materials Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, FL 33004-3023 954.924.7243 hartt@oe.fau.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
University of Florida, Gainesville, Florida	Ph.D.	1966	Metallurgical Engineering
Virginia Polytechnic Institute and State University, Blacksburg, Virginia	BS.Eng	1961	Metallurgical Engineering

Positions and Employment

- Recipient, Second Annual Rotary Club of Boca Raton award to FAU faculty member for research accomplishment, 1982.
- Recipient, FAU College of Engineering award to outstanding teacher, 1987.
- Recipient, FAU Sigma Xi Chapter award for research contributions, 1991.
- Recipient, Professorial Excellence Award, Florida Atlantic University, 1998.
- Recipient, Distinguished Service Award, NACE International, The Corrosion Society, 2005.
- Designated Fellow by NACE International, The Corrosion Society, 2005.

PROFESSIONAL AND HONORARY SOCIETIES:

- Registered Professional Engineer, State of Florida (registration no. 15726)
- National Association of Corrosion Engineers
- American Society of Testing and Materials
- Tau Beta Pi
- Alpha Sigma Mu

RESEARCH INTERESTS AND HISTORICAL INVOLVEMENTS

1. Areas of Expertise:
 - Fatigue of Welded Steel Connections in Sea Water.
 - Fracture of Structural Materials and Environmental Cracking.
 - Marine Corrosion and Corrosion Control.
 - Corrosion and Corrosion Prevention of Steel in Concrete.

2. Organized and served as principal investigator for a series of research projects which have been conducted continuously over the past twenty years addressing corrosion control and cathodic protection of steel in sea water. Sponsors include the Office of Naval Research, Sea Grant Program of NOAA, Minerals Management Service and two Joint Industry Projects with nine sponsors from the offshore community. Present ongoing activities focus upon criteria for design of cathodic protection systems for deep water and retrofit applications.
3. Organized and served as principal investigator for a series of research projects which have been conducted continuously over the past twenty-five years addressing corrosion of steel in concrete and its prevention. Major sponsors include the Strategic Highway Research Program, National Cooperative Highway Research Program, Federal Highway Administration, Florida Department of Transportation, Dow Chemical company, W. R. Grace. Present and evolving practice for cathodic protection of prestressing tendon in concrete is based upon results of this research.
4. Organized and served as principal investigator for a series of research projects which have been conducted continuously over the past twenty-five years addressing fatigue of structural and high strength steels in sea water under conditions relevant to design of both shallow and deep water structures. Sponsors include the National Science Foundation, American Petroleum Institute, Naval Research Laboratory and approximately fifteen companies with interests in offshore structures. Much of the present fatigue design practice for offshore structures in the United States reflects the results of this research.

PLENARY/HONORARY LECTURES:

1. W.H. Hartt, "Marine Cathodic Protection - Historical Perspective and Future Challenges," Plenary Lecture, Eighth International Congress on Marine Corrosion and Fouling, International Journal of Marine Biology and Oceanography, Vol. 19 Suppl., 1993, p. 497.
2. W.H. Hartt and W. Wang, "A Perspective of Marine Cathodic Protection and a Proposed New Approach to Cathodic Protection Design," Magisterial Lecture presented at the First International Mexican Symposium on Metallic Corrosion, March 7-11, 1994, Merida, Mexico.
3. W.H. Hartt, "The Interactive Nature of Fatigue and Cathodic Protection with Application to Offshore Structures," Plenary Lecture, Proceedings, International Conference on Performance of Dynamically Loaded Welded Structures, Eds., S. J. Maddox and M. Prager, The Welding Research Council, July 14-15, 1997, pp. 354-374, San Francisco.
4. W.H. Hartt, "Historical Development, Present Understanding, and Future Considerations Regarding Cathodic Protection of Offshore Structures," Plenary Lecture, Proceedings Eighth Middle East Corrosion Conference, May 18-20, 1998, The Bahrain Society for Engineers and NACE International, pp. 28-51.

5. W.H. Hartt, "History and Recent Developments Regarding the Theory and Practice of Cathodic Protection for Offshore Structures and Pipelines," Plenary Lecture, Proceedings Eleventh Asian Corrosion Congress, Nov. 1-5, 1999, Vietnam Corrosion and Metal protection Association.
6. W.H. Hartt, "Corrosion Control of Offshore Structures," Plenary Lecture presented at Second International Symposium on the Safety Enhancement of Building and Special Works, Seoul, February 16-18, 2004.
7. W.H. Hartt, "Corrosion Protection for Submerged Marine Structures, Third International Symposium on Surface Protective Coatings, Nov. 12-14, 2005, Mumbai, India.
8. W.H. Hartt, "Life-Cycle Model Monitoring for Corrosion Induced Deterioration of Reinforced Concrete Structures," International Conference of Condition Monitoring and Diagnosis, April 2-5, 2006, Changwon, Korea.

BIOGRAPHICAL SKETCH

NAME Hirons, Amy Christia	POSITION TITLE Research Scientist Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 hirons@nova.edu
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Alaska, Fairbanks, AK	PhD	2000	Biological Oceanograph
University of Northern Colorado, Greeley, CO	MS	1989	Zoology
Hawaii Loa College, Kaneohe, HI	BA	1986	Biology

PROFESSIONAL EXPERIENCE

Research Scientist, Nova Southeastern University Oceanographic Center	2006-
Research Professor, Institute of Marine Science, University of Alaska Fairbanks	2000-2006
Research Assistant, Institute of Marine Science, University of Alaska Fairbanks	1992-2000
Biological Scientist II, Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville	1988-1992
Research Assistant, Zoology Department, University of Northern Colorado, Greeley	1986-1988

RESEARCH

Research Experience

Stable isotope and chemical analysis of body tissues from aquatic and terrestrial organisms and sediments. Determination of trophic web dynamics in marine and freshwater ecosystems. Tracing geographic variability in marine food resources. Marine mammal and zooplankton ecology.

Field experience in biological sampling of marine mammals and fishes, plankton sampling, water quality analysis and scientific diving. Computer-based statistical applications to biological data sets. Time-series analysis and statistical testing.

Research Interests

Paleoceanography, paleoenvironmental reconstruction, biogeochemical cycles

Marine trophic dynamics

Marine mammal ecology of the North Pacific Ocean

Isotopic fluctuations of marine organisms (including zooplankton) due to geographic variability

Publications

Hirons AC, Finney BP, Springer AM, Potter C (in review) Evidence of environmental fluctuation since the 19th century in Steller sea lions (*Eumetopias jubatus*) using stable isotope ratios. Canadian Journal of Fisheries and Aquatic Sciences.

Hirons AC, Schell DM, Kline TC (in review) Trophic variability of harbor seals (*Phoca vitulina*) in Prince William Sound, Alaska. Marine Mammal Science.

- Sigler MF, LB Hulbert, CR Lunsford, N Thompson, K Burek, AC Hirons (2006) Diet of Pacific sleeper sharks, a potential Steller sea lion predator, in the north-east Pacific Ocean. *Journal of Fish Biology* 69: 392-405.
- Hirons AC, Wynne KM (2005) Seasonal forage patterns in Steller sea lions. Final report to NOAA Project NA17FX1408.
- Hirons, A.C., Schell, D.M. and Finney, B.P. 2001. Temporal records of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in North Pacific pinnipeds: inferences regarding environmental change and diet. *Oecologia* 129:591-601.
- Hirons, A.C., Schell, D.M. and St. Aubin, D. 2001. Growth rates of vibrissae of harbor seals (*Phoca vitulina*) and Steller sea lions (*Eumetopias jubatus*). *Can. J. Zool.* 79:1053-1061.
- Hirons, A.C., Schell, D.M. and Kline, Jr., T.J., in review, 2001. Trophic variability of harbor seals (*Phoca vitulina*) in Prince William Sound, Alaska. *Mar. Mamm. Sci.*
- Hirons, A.C. and Schell, D.M. 2000. Trophic status of Steller sea lions in Alaskan waters using isotope ratios. Final report to the North Pacific Universities Consortium on Marine Mammal Research. University of British Columbia, Vancouver, Canada.
- Schell, D.M. and Hirons, A.C. 1999. Isotope ratio studies in Prince William Sound marine mammals. Final report to the *Exxon Valdez* Oil Spill Trustees Council. Restoration Project 98170, University of Alaska Fairbanks, Alaska. 114pp.
- Schell, D.M. and Hirons, A.C. 1998 Testing conceptual models of marine mammal trophic dynamics using carbon and nitrogen stable isotope ratios. Final report. OCS Study MMS 98-0031. Coastal Marine Institute, University of Alaska Fairbanks, Alaska. 137 pp.

Current and Recent Collaborators

Dr. Jonathan Shenker, Dr. Maribeth Murray, Dr. Lawrence Duffy, Dr. Bruce P. Finney, Dr. Benjamin Fitzhugh, Dr. Charles Potter, Dr. Alan Springer, Dr. Kate Wynne, Dr. Paul Wade, Dr. Margaret Krahn, Dr. Thomas J. Kline, Jr., Dr. Richard Knecht, Dr. William J. Lindberg, Dr. Donald M. Schell, Dr. David St. Aubin

Ph.D. Thesis Advisor (University of Alaska Fairbanks): Dr. Donald M. Schell

Postdoctoral Advisor (University of Alaska Fairbanks): Dr. Bruce P. Finney

Graduate Students: Pieter de Hart (PhD), Molly Boughan (MS), Cody Strathe (MS)

BIOGRAPHICAL SKETCH

NAME Keith, Edward Oliver	POSITION TITLE Associate Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 954.262.8322
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of California, Santa Cruz	PhD	1984	Biology
Colorado State University	MS	1978	Physiology & Biophysics
Colorado State University	BS	1975	Wildlife Biology

PROFESSIONAL EXPERIENCE

1999-Present	Associate Professor	Oceanographic Center Nova Southeastern University
1995-2004	Lecturer	Marine Sciences, Dept. Biology University of Miami, Coral Gables, FL
1986-1999	Adjunct Assistant Professor	Department of Biochemistry Univ. Miami Medical School, Miami
1994-1998	Associate Professor of Biochemistry	College of Medical Sciences Nova Southeastern University
1986-1994	Assistant Professor of Biochemistry Sciences	Southeastern University of the Health North Miami Beach, FL
1980-1985	Director of Basic Sciences	Palmer College of Chiropractic - West Sunnyvale, CA
1978 Tsaile, AZ	Lecturer	Navajo Community College,
1973-1974 CO.	Environmental Biologist	AMAX Exploration, Inc. Denver,

PUBLICATIONS

Refereed Journal Articles

Walker, R.J., A.E. Yankovsky, E.O. Keith, and D.K. Odell. (2005). Environmental correlates to cetacean mass stranding sites in Florida. *Marine Mammal Science* 21(2):337-335.

Keith, E.O., S. Cruz, L. Gedeon, K. Latif, S. Patel, S. Qadeer, M. Sabogal, M. Zaman, and L.E. Janoff. (2003). Lysozyme adhesion to the four major types of contact lens materials. *Am. Biotechnol. Lab.* 21(2):60-61.

Keith, E.O., M. Boltz, R. Gadh, R. Ghorsriz, D. Mangatt, and L. Janoff. (2001). Adhesion of tear proteins to contact lenses and vials. *Biotechnol. Appl. Biochem.* 34:5–12.

Keith, E.O., and Ortiz, C.L. (1989). Glucose kinetics in neonatal elephant seals during postweaning aphagia. *Marine Mammal Sci.* 5(2):99-115.

Keith, E.O., Condit, R.S., and LeBoeuf, B.J. (1984). California sea lions breeding at Año Nuevo Island. *J. Mammal.* 65(4):695.

Keith, E.O., Ellis, J.E., Phillips, R.W., Dyer, M.I., and Ward, G.M. (1981). Some aspects of urea metabolism in North American bison. *Acta Theriol.* 26(14):257-268.

Books

Keith, E.O., and J. Scharnitz. (2005). Laboratory experiments in biochemistry, 3rd Ed. Kendall/Hunt Publishing Company, Dubuque, IA, U.S.A. 139 pp.

Keith, E.O. (2001). Survey of Marine Mammals. Kendall/Hunt Publishing Company, Dubuque, IA, U.S.A. 225 pp.

Theses and Technical Reports

Keith, E.O. (2005). Development of an underwater infrared camera to detect manatees. Final Report to the Manatee Avoidance Technology Program, Contract No. FWC 03/04-28, Florida Fish and Wildlife Conservation Commission, 100 8th Avenue, SE, St. Petersburg, FL 33701.

Aragones, L.A., and Keith, E.O. (2004). Ecology and conservation of cetaceans in the southern Tañon Strait area – Part I (Conservation). Report to the Governments of the province of Negros Oriental and the city of Bais, Philippines. 65 pp.

Ortega-Argueta, A., E. Portilla-Ochoa, and E. O. Keith. (2003). Manatee recovery plan for wetlands of Alvarado, Veracruz, Mexico. Annual Report to the Wildlife Trust, Ref. #02-03-099. 32 pp.

BIOGRAPHICAL SKETCH

NAME Kennan, Sean C.	POSITION TITLE Assistant Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Scripps Inst. Oceanography, UCSD, LaJolla, CA	Postdoc	1997-2000	Oceanography
University of Hawaii at Manoa, Honolulu, HI	PhD	1997	Oceanography
University of Hawaii at Manoa, Honolulu, HI	MS	1993	Oceanography
University of Massachusetts at Amherst, MA	BS	1989	Physics & Astronomy

Appointments

05/2000–Present: Asst. Professor, Oceanographic Ctr., Nova Southeastern Univ., Dania, FL
 08/2005–12/2005: Fulbright Res. Fellow, Univ. Pierre et Marie Curie - Jussieu, Paris, France.
 05/1997–04/2000: Postgrad. Researcher, Scripps Inst. Oceanography, UCSD, La Jolla, CA
 08/1990–04/1997: Research Asst., Dept. Oceanography, Univ. Hawaii, Honolulu, HI
 08/1994–12/1995: Teaching Asst., Dept. Oceanography, Univ. Hawaii, Honolulu, HI
 09/1988–05/1990: Tech. Asst., Five College Radio Astron. Obs., Univ. Mass., Amherst, MA

Relevant Publications

Menkes, C. E., J. Vialard, S. C. Kennan, J.-P. Boulanger, and G. Madec (2006): A Modeling Study of the Impact of Tropical Instability Waves on the Heat Budget of the Eastern Equatorial Pacific. *J. Phys. Oceanogr.*, v36, pp847–865.

Kennan, S. C., and P. P. Niiler (2003): The Effects of Wind Forcing and Pycnocline Stresses on Zonal Currents in the Western Equatorial Pacific. *J. Phys. Oceanogr.*, v33, n2, pp2643–2656.

Kennan, S. C., and P. P. Niiler (2003): Estimating Sea Level Slope on the Equator. *J. Phys. Oceanogr.*, v33, n12, pp2627–2642.

Menkes, C. E., S. C. Kennan, P. Flament, Y. Dandonneau, S. Masson, B. Biessy, E. Marchal, G. Eldin, J. Grelet, Y. Montel, A. Morliere, A. Lebourges-Dhaussy, C. Moulin, G. Champalbert, and A. Herbland (2002): A Whirling Ecosystem in the Equatorial Atlantic. *Geophys. Res. Letters*, 10.1029/2001GL014576, 1 June 2002.

Kennan, S. C., and P. Flament (2000): Observations of a Tropical Instability Vortex. *J. Phys. Oceanogr.*, v30, n9, pp2277–2301.

Other Publications

Kennan, S. C., P. P. Niiler, and A. Sybrandy (1998): Advances in Drifting Buoy Technology. *WOCE International Newsletter* n30, pp7-9.

Flament, P., S. C. Kennan, C. F. Lumpkin, and E. D. Stroup (1998): The Ocean, in *Atlas of Hawai'i*, Univ. of Hawaii Press, pp82-86.

Kennan, S. C. (1997): Observations of a Tropical Instability Vortex. Ph.D. Dissertation, Univ. of Hawaii, Honolulu, HI 190pp.

Flament, P., S. C. Kennan, R. Knox, P. P. Niiler, R. Bernstein (1996): The Three-dimensional

Structure of an Upper Ocean Vortex in the Central Tropical Pacific. *Nature*, v382, pp610–613.

Kennan, S. C, and R. Lukas (1996): Saline Intrusions in the Intermediate Waters North of O’ahu, Hawai’i. *Deep-Sea Res. II*, v43, pp215–231.

Synergistic Activities

2005: Fulbright Research Fellow, Commission franco-am’ericain d’echanges universitaires et culturels (LOCEAN, Univ. Pierre et Marie Curie - Jussieu, Paris, France)

2005: Ported OPA-9/LIM-2 (community coupled general circulation ocean/ice model) code to Mac-G5 (OS X 10.4).

2003–present : Program Coordinator for development and management of MS degree program in Physical Oceanography at Nova SE Univ.

2003–2005 : NSU Faculty Advisory Committee

2002–present : NSU graduate courses taught: ”Concepts in Physical Oceanography”, ”Ocean Circulation”

06-07/2001 Chief Scientist/co-PI: Testing the Sverdrup Theory of the NECC, R/V Roger Revelle, 42 days (seasoar, drifters, standard and special mount ADCPs).

2001: Oversaw NSF-funded construction of general use equipment (UNOLS) mount for 600 kHz ADCP on R/V Revelle (adapted from MPL/SIO special use)

1997–present: Peer reviewer: NSF (reviewer and panelist), NOAA, *J. Phys. Oceanogr.*, *J. Geophys. Res.*, *J. Marine Res.*, *Geophys. Res. Letters*, *Nature*

1997–1998: PORD/SIO/UCSD seminar and speaker/student meeting organizer.

1996: Guest lecturer (6 lectures) ”Introduction to Physical Oceanography,” CORE course for all U. Hawaii Oceanography graduate students.

1996: Achievement Rewards for College Scientists & Scholar of the Year

1993: Univ. of Hawaii Watumall Scholarship

1991: Achievement Rewards for College Scientists

Collaborators & Co-Editors

Pierre Flament (Univ. Hawaii)

Jerome Vialard, Gurvan Madec, Yves Donnanneau, Sebastian Masson (LOCEAN/Univ. Paris)

Yves du Penhoat, Jean-Phillipe Boulanger, Gerard Eldin (LEGOS, Toulouse)

Christophe Menkes (IRD/Noumea)

Janet Sprintall, Pearn P. Niiler (SIO/UCSD)

Graduate and Postdoctoral Advisors

Pearn P. Niiler - SIO, Univ. California, San Diego (postdoctoral)

Pierre Flament - Univ. Hawaii (PhD)

Roger Lukas - Univ. Hawaii (MS)

Eric Firing, Fei-Fei Jin, Douglas Luther, Bo Qiu, Bin Wang - Univ. Hawaii (MS/PhD committees)

Thesis Advisor and Postgraduate-Scholar Sponsor

Peter Gaube (MS in progress)

BIOGRAPHICAL SKETCH

NAME Kohler, Kevin E.	POSITION TITLE Director of Computing Services, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Miami, Coral Gables Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida	BS	1975	Physics/Mathematics
	MS	1980	Physical Oceanography

Appointments

1983-present: Programmer/Coord. Computing Services, Oceanographic Center,
Nova Southeastern University Dania Beach FL

1982-83: Physical Oceanographer, Science Applications, Inc., Miami, FL

1980-1982: Physical Oceanographer, NOAA/AOML, Miami, FL

Relevant Publications

Kohler, K.E. and S.M. Gill, 2006. Coral Point Count with Excel extensions (CPCe): A Visual Basic program for the determination of coral and substrate coverage using random point count methodology. *Computers and Geosciences*. Vol. 32, No. 9, pp. 1259-1269. DOI: 10.1016/j.cageo.2005.11.009

Kohler, K.E. and R.E. Dodge, 2006. Visual_HEA: Habitat Equivalency Analysis software to calculate compensatory restoration following natural resource injury. *Proceedings of the 10th International Coral Reef Symposium*. Okinawa, Japan. pp. 1611-1616.

Riegl B.M., S.J. Purkis, K.E. Kohler, and R.E. Dodge, 2006. Spatial patterns in Arabian Gulf coral assemblages (Jebel Ali, Dubai, U.A.E.) in response to temperature-forcing. *Proceedings of the 10th International Coral Reef Symposium*. Okinawa Japan. pp. 683-687.

Vinayachandran, P.N., J.P. McCreary, Jr., R.R. Hood, and K.E. Kohler (2005), A numerical investigation of the phytoplankton bloom in the Bay of Bengal during Northeast Monsoon, *J. Geophys. Res.*, 110, C12001, doi:10.1029/2005JC002966.

Hood, R.R., K.E. Kohler, J.P. McCreary, and S. Smith, 2003. A four-dimensional validation of a coupled physical-biological model of the Arabian Sea. *Deep Sea Research II*, 50, p. 2917-2945.

McCreary, J.P., K.E. Kohler, R.R. Hood, S. Smith, J. Kindle, A.S. Fischer, and R.A. Weller, 2001. Influences of diurnal and intraseasonal forcing on mixed-layer and biological variability in the central Arabian Sea. *J. Geophys. Res.*, 106, C4, p. 7139-7155.

Han, W., J.P. McCreary, and K.E. Kohler, 2001. Influence of precipitation minus evaporation and Bay of Bengal rivers on dynamics, thermodynamics, and mixed layer physics in the upper Indian Ocean. *J. Geophys. Res.*, 106, C4, p.6985-6916.

McCreary, J.P., K.E. Kohler, R.R. Hood, and D.B. Olson, 1996: A four component ecosystem model of biological activity in the Arabian Sea. *Prog. Oceanogr.*, 37, 117-165.

Synergistic Activities

2004-present: Developed graphical interface program (Visual_HEA) for Habitat Equivalency Analysis (HEA) for use in compensatory restoration determination following injury to natural resources. Visual_HEA is distributed worldwide.

2002-present: Developed random point count analysis program (CPCe) for use in coral reef monitoring and assessment which is freely distributed worldwide.

2002-3: Developed web-based display system for coupled biological-physical model results enabling simultaneous analysis by investigators widely separated.

1996-present: Developed Fortran-callable PostScript plotting library (PSPLOT) which is freely distributed worldwide.

1993-4: ported Fortran code for layer models to CSPI MiniMap co-processors, attaining a 22x speed increase.

Collaborators

Raleigh Hood (HPL/UMCES)

John Kindle (NRL)

Julian McCreary (IPRC),

Andrew Moore (UC Boulder)

Sharon Smith (RSMAS, UM)

Robert Weller (WHOI)

BIOGRAPHICAL SKETCH

NAME Larry F. Lemanski	POSITION TITLE Professor of Biomedical Science and of Biology		
eRA COMMONS USER NAME lemanski	Florida Atlantic University		
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Wisconsin, Platteville, WI	B.S.	1966	Biology
Arizona State University, Tempe, AZ	M.S.	1968	Zoology
Arizona State University, Tempe, AZ	Ph.D.	1971	Zoology
University of Pennsylvania, Philadelphia, PA	Postdoc	1971-1975	Cell Biol/Biochemistry

Employment

1971–1975	Postdoctoral Fellow/Research Associate, University of Pennsylvania, Philadelphia
1975–1977	Assistant Professor Anatomy, University of California, San Francisco
1977–1983	Assist, Assoc (tenure) and Full Professor of Anatomy, University of Wisconsin, Madison
1983–1997	Chairman and Professor of Anatomy and Cell Biology, SUNY Health Science Center, Syracuse
1986–1990	Director, Cell and Molecular Biology Program, SUNY Health Science Center, Syracuse
1987–1997	Research Professor, Department of Biology, Syracuse University, Syracuse
1997–2001	Professor of Med Physiology and of Biology, Texas A&M University, College Station
1997–2001	Associate Vice President for Research, Texas A&M University, College Station
2001–pres	Professor of Biomedical Sciences, Biology, & Chemistry, Florida Atlantic Univ, Boca Raton
2001–pres	Vice President for Research and Graduate Studies, Florida Atlantic University, Boca Raton
2001-pres	President, Florida Atlantic Research Corporation, Boca Raton
2002-pres	Professor, Department of Cell Biology, University of Miami Miller School of Medicine, Miami (Volunteer)

Honors

Honor Grad., Univ. Wisconsin (1966); Who's Who Among Students in Amer. Coll and Univ. (1966); EMSA Presidential Scholarship (1970); NIH Predoctoral Fellow (1968-1971); NIH Postdoctoral Fellow (1971-1973); MDA Postdoctoral Fellow (1973-1975); AHA Est. Investigator (1976-1981); Katz Basic Science Res. Prize (1978); Who's Who in America (1988-); Who's Who in the World (1993-); Distinguished Alumnus Award, Univ. Wisconsin-Platteville (1998); New York State/United Univ. Professions Award for Professional Excellence (1990); SUNY President's Award for Adv of Affirmative Action (1995); Board of Directors of Oak Ridge Assoc. Univ (2000-03), Fellow of the American Association for the Advancement of Science (2001-present) Mathew Romer Foundation "See the Light Award" (2003).

Public Service

Natl. Institutes of Health regular and ad hoc Study Sections, 1984-present; Public Examiner,

Bhopal University, India; Amer. Heart Assoc./Wisconsin Affiliate Research Comm., 1982-1983; American Ed., Asian J. of Experimental Zoology (1984-88); Member of Joint Steering Comm. for Public Policy's Congressional Liaison Comm. (1993-present); New York Affiliate Amer. Heart Assoc. Research Comm. (1995-1998); Cardiovascular Study Sect. (1994-1998); Amer. Assoc. of Anatomy Chairman, Executive Comm. (1998-2001); American Association of Anatomists Public Relations Comm. (2001-present); Florida Space Res Inst Board of Directors (2003-pres); NIH Director's Roadmap Initiative Review Panel (2004-present); Florida/PR AHA Peer Review and Research Committee (2002-pres).

Representative Publications (Total of over 120 full-length peer-reviewed papers)

1. Lemanski, L.F., M. Mooseker, L. Peachey and M. Iyengar. Studies muscle protein in embryonic myocardial cells of cardiac lethal mutant Mex axolotls of use of heavy meromyosin binding and sodium dodecyl sulfate polyacrylamide gel electrophoresis. *J. Cell Biol.* 68: 375-388, 1976.
2. Lemanski, L.F., B. Marx and C. Hill. Evidence for abnormal heart induction in cardiac mutant Mexican salamanders. *Science* 196: 894-896, 1977.
3. Lemanski, L.F., Role of tropomyosin in actin filament formation in embryonic salamander heart cells. *J. Cell Biol.* 82: 227-238, 1979.
4. Lemanski, L.F., D.H. Paulson and C.S. Hill. Normal anterior endoderm corrects the heart defect in cardiac mutant salamanders (*Ambystoma mexicanum*). *Science*, 204: 860-862, 1979.
5. Woodroffe and Lemanski. Two actin variants in developing axolotl hearts. *Dev. Biol.* 82: 172-179, 1981.
6. Lemanski, L.F. and Z.H. Tu. Immunofluorescent studies for myosin, actin, tropomyosin and alpha-actinin in cultured cardiomyopathic hamster heart cells. *Dev. Biol.* 97: 338-348, 1983.
7. Davis, L.A. and L.F. Lemanski. Induction of myofibrillogenesis in cardiac lethal mutant axolotl hearts rescued by RNA derived from normal endoderm. *Development* 99: 145-154, 1987.
8. Isobe, Y., F. Warner and L.F. Lemanski. Three-dimensional immunogold localization of alpha-actinin within the cytoskeletal networks of cultured cardiac muscle and non-muscle cells. *Proc. Nat. Acad. Sci.* 85: 6758-6762, 1988.
9. Gaur, A., L.F. Lemanski and D.K. Dube 1995 Identification and expression of a homologue of the murine Hox A5 gene in the Mexican axolotl (*Ambystoma mexicanum*). *Gene*, 162: 249-253.
10. Erginel-Unaltuna, N., D.K. Dube, D.R. Robertson and L.F. Lemanski 1995 In vivo protein synthesis in developing hearts of normal and cardiac mutant axolotls, *Ambystoma mexicanum*. *Cell. Molec. Biol. Res.*, 41: 181-187.
11. Ward, S., M.E. Fransen, D.K. Dube, D.A. Fischman and L.F. Lemanski 1995 Immunohistochemical analysis of c-protein isoforms in cardiac and skeletal muscle of the axolotl, *Ambystoma mexicanum*. *Cell Tiss. Res.*, 282(3): 399-406.
12. Lemanski, L.F., S.M. LaFrance, N. Erginel-Unaltuna, E.A. Luque, S.M. Ward, M.E. Fransen, F.J. Mangiacapra, M. Nakatsugawa, S.L. Lemanski, R.B. Capone, K.J. Goggins, B.P. Nash, R. Bhatia, A. Dube, A. Gaur, R.W. Zajdel, Y. Zhu, B.J. Spinner, K.M. Pietras, S.F. Lemanski, C.P. Kovacs, X. VanArsdale, J.L. Lemanski and D.K. Dube 1995 The cardiac mutant gene c in axolotls: cellular, developmental and molecular studies (invited article). *Cell. Molec. Biol. Res.*, 41(4): 293-305.
13. Ward, S.M., D.K. Dube, M.E. Fransen and L.F. Lemanski 1996 Differential expression of c-protein isoforms in the developing heart of normal and cardiac lethal mutant axolotls (*Ambystoma mexicanum*) *Dev. Dynamics*, 205(2): 93-103.

14. Ward, S., B.J. Spinner, A. Dube, A. Gaur, N. Erginel-Unaltuna, L.F. Lemanski and D.K. Dube 1996 Expression of myosin heavy chain transcripts in normal and cardiac mutant Mexican axolotls. *Biochem. Molec. Biol. Int.*, 38: 113-121.
15. Bhatia, R., D.K. Dube and L.F. Lemanski 1996 Nucleotide sequence and expressions of ribosomal protein S3 mRNA during embryogenesis in the Mexican axolotl (*Ambystoma mexicanum*). *Biochem. Molec. Biol. Int.*, 38: 1079-1085.
16. Zajdel, R., Y. Zhu, M.E. Fransen and L.F. Lemanski 1996 A method for the isolation and culture of embryonic myocardiocytes from Mexican axolotl. *Int. J. Dev. Biol.*, 40: 907-908.
17. Lemanski, L.F., M. Nakatsugawa, R. Bhatia, N. Erginel-Unaltuna, B. Spinner and D.K. Dube 1996 A specific synthetic RNA promotes cardiac myofibrillogenesis in the Mexican axolotl. *Biochem. Biophys. Res. Com.*, 229: 974-981.
18. Holland, J.A., J.W. Meyer, D.K. Johnson, R.W. Abdul-Karim, V. Patel, L.M. Ziegler, L. Kauffman, K.J. Schillinger and L.F. Lemanski 1996 Protein kinase C inhibitors prevent cultured human endothelial cell stress fiber formation, but not heightened endocytosis. *Endothelium*, 4: 207-218.
19. Lemanski, S.F., C.P. Kovacs and L.F. Lemanski 1997 Analysis of the three-dimensional distributions of α -actinin, ankyrin and filamin in developing hearts of normal and cardiac mutant axolotls, *Ambystoma mexicanum*. *Anat. and Embryol.*, 195: 155-163.
20. Luque, E.A., B.J. Spinner, S. Dube, D.K. Dube and L.F. Lemanski 1997 Differential expression of a novel isoform of alpha-tropomyosin in cardiac and skeletal muscle of the Mexican axolotl (*Ambystoma mexicanum*). *Gene*, 185: 175-180.
21. Holland, J.A., J.W. Meyer, M.E. Schmitt, M.D. Sauro, D.K. Johnson, R.W. Abdul-Karim, V. Patel, L.M. Ziegler, K.J. Schillinger, R.F. Small and L.F. Lemanski 1997 Low-density lipoprotein stimulated peroxide production and endocytosis in cultured human endothelial cells: mechanisms of action. *Endothelium*, 5: 191-207.
22. Lemanski, L.F., R.W. Zajdel, M. Nakatsugawa, R. Bhatia, B.J. Spinner, M.E. Fransen, A.F. Gaur, M.D. McLean, S.L. Lemanski and D.K. Dube 1997 Molecular biology of heart development in the Mexican axolotl, *Ambystoma mexicanum*. *J. Tsitologiya (Cytology)*, 39: 918-927.
23. Luque, E.A., B. Spinner, S. Dube, D.K. Dube and L.F. Lemanski. Differential expression of a novel isoform of alpha-tropomyosin in cardiac and skeletal muscle of the Mexican axolotl *Gene* 185: 175-180, 1997.
24. Zajdel, R.W., Y. Zhu, M.E. Fransen and L.F. Lemanski. A primary cell culture model for defective cardiac myofibrillogenesis in Mexican axolotl embryos. *In vitro Cell Dev. Biol.* 33:677-680, 1997.
25. Gaur, Bhatia, Spring-Mills, Lemanski and Dube The heart of metamorphosing Mex. axolotl but not that of the cardiac mutant is associated with the upregulation of Hox A5. *Biochem. Biophys. Res. Com.*, 245: 746-751, 1998.
26. Bhatia, R., A. Gaur, Dube, L.F. Lemanski. Cloning and sequencing of the cDNA for an RNA-binding protein from the Mex axolotl: Binding affinity of the in vivo synthesized protein. *Biochim. Biophys. Acta* 1398(3): 265-274, 1998.
27. Gaur, A., D.K. Dube and L.F. Lemanski. Cloning, sequencing and expression of a novel homeobox gene *AxNox-1* from the Mexican axolotl. *Gene*, 216: 179-188, 1998.
28. Zajdel, Lemanski, Muthuchamy, Wieczorek, McLean, Lemanski and Dube. Ectopic expression of tropo- myosin in cardiac mutant axolotl hearts promotes organized myofibril formation. *Dev. Dynamics* 213: 412- 420, 1999.

29. Zajdel, R.W., D.K. Dube and L.F. Lemanski. The cardiac mutant axolotl is a unique animal model for evaluation of cardiac myofibrillogenesis. *Expt. Cell Res.* 248(2): 557-566, 1999.
30. Bhatia, R., D.K. Dube, A. Gaur, D.R. Robertson, S.L. Lemanski, M.D. McLean and L.F. Lemanski. Expression of axolotl RNA-binding protein during development of the Mexican axolotl. *Cell Tissue Res.* 297: 283-290, 1999.
31. Zajdel, McLean, Istamangil, L. Lemanski and Dube Alteration of cardiac myofibrillogenesis by liposome-mediated delivery of exogenous proteins and nucleic acids into whole embryonic hearts. *Anat. Embryol.* 2000.
32. K.J. Lee, B. Reidel, C. Zhang, L.F. Lemanski and J.W. Walker. Thyroid hormone regulates ssTnI inactivation in cTnI deficient mouse hearts. *J Mol. Cell Cardiol.* 32: 2221-2228, 2000.
33. Lemanski, L.F., F. Meng, S.L. Lemanski, N. Dawson, C. Zhang, Q. Li, M. Nakatsugawa, D.K. Dube and X. Huang., Creation of chimeric mutant axolotls: a model to study early embryonic heart development in Mexican axolotls. *Anat. Embryol.* 203: 335-342, 2001.
34. Gaur, Zajdel, Bhatia, Isitmangil, Denz, Robertson, Lemanski and Dube Expression of HoxA5 in heart is upregulated during thyroxin-induced metamorphosis in Mex axolotl *Cardiol. Toxicol.*, 1: 225-235, 2001.
35. Zajdel, R.W., M.D. McLean, L.F. Lemanski and D.K. Dube Manipulation of myofibrillogenesis in whole embryonic hearts. *Myofibrillogenesis* (Ed. D.K. Dube, Springer Verlag) pp. 87-100, 2002.
36. Lemanski, L.F., X. Huang, R.W. Zajdel, S.L. Lemanski, C. Zhang, F. Meng, D. Foster, Q. Li and D.K. Dube. Cellular, molecular and developmental studies on heart development in normal and cardiac mutant axolotls. *Myofibrillogenesis* (Ed. D.K. Dube, Springer Verlag) pp. 207-222, 2002.
37. Spinner, Zajdel, McLean, Denz, S. Dube, Mehta, Choudhury, Nakatsugawa, Dobbins, Dube and Lemanski. Characterization of a TM-4 type tropomyosin that is essential for myofibrillogenesis and contractile activity in embryonic hearts of the Mexican axolotl. *J. Cell. Biochem. J Cell Biochem* 85: 747- 761, 2002
38. Huang, X., J. Li, D. Foster, S.L. Lemanski, C. Zhang and L.F. Lemanski 2002 Protein kinase c mediated desmin phosphorylation is related to myofibril disarray in cardiomyopathic hamster heart. *Exper. Biol. Med.* 227: 1039-1046.
39. Zhang, C., S.M. LaFrance, S. Lemanski, X. Huang, D. Dube and L.F. Lemanski 2003 Sheep heart RNA stimulates myofibril formation and beating cardiac mutant axolotl hearts in organ culture. *Anat. Embryol.* 206: 419-427.
40. Meng, F., X.P. Huang, C. Zhang, R.W. Zajdel, D. Foster, N. Dawson, S.L. Lemanski, D. Zawieja, D.K. Dube and L.F. Lemanski 2003 Relationship between cardiac protein tyrosine phosphorylation and myofibrillogenesis during axolotl heart development. *Tiss Cell* 35: 133-142.
41. Zhang, C., D. Dube, X. Huang, R.W. Zajdel, R. Bhatia, D. Foster, S.L. Lemanski and L.F. Lemanski 2003 A point mutation in bioactive RNA results in RNA secondary structure alteration and failure of mutant heart correction in Mexican axolotls. *Anat. Embryol.* 206: 495-506.
42. Zhang, C., F. Meng, X.P. Huang, R. Zajdel, S.L. Lemanski, D. Foster, N. Erginel-Unaltuna, D.K. Dube and L.F. Lemanski 2004 Downregulation of N1 gene expression inhibits the initial heartbeating and heart development in axolotls. *Tiss. Cell*, 36: 71-81.
43. Zhang, C., H.E. Oskinska, S.L. Lemanski and L.F. Lemanski 2005 Changes in

myofibrils and cytoskeleton of neonatal hamster cardiomyocytes in vitro: an immunofluorescence study. *Tiss Cell* 37: 435-445.

44. Zhang, C., K.M. Pietras, G.F. Sferrazza, D.K. Dube, S.L. Lemanski and L.F. Lemanski 2006 Molecular and immunohistochemical analyses of cardiac troponin T during the cardiac development in the Mexican axolotls, *Ambystoma mexicanum*. (In Press, *Journal of Cellular Biochemistry*).

Research Projects Ongoing or Completed During the Last 3 Years

RO1 HL061246 Lemanski (PI)
NIH/NHLBI 04/01/03-03/31/07

“Studies on a Novel RNA that Promotes Heart Development”

The studies of this proposal are designed to investigate a novel RNA derived from endoderm-conditioned medium has the ability to promote myofibrillogenesis in cardiac mutant axolotl heart cells and cause the usually-quiescent mutant heart to beat. The gene for the RNA is being cloned, sequenced and mutated to determine the mechanism of action in culture and to determine the active site(s).

Role: PI

Grant-in-Aid Lemanski (PI)
American Heart Assn (FI Afil) 07/01/02-06/30/05

"Vertebrate Heart Specification and Myofibrillogenesis During Early Embryogenesis"

This research analyzes a unique protein which is involved in embryonic heart development in axolotls. Studies are underway to determine the role of this protein in early heart differentiation. There is no scientific overlap with the current application.

Role: PI

RO1 HL58435 Lemanski (PI)
NIH/NHLBI 07/01/97-06/30/05

“A Novel Protein Associated with Heart Development”

The studies of this proposal are designed to investigate a newly discovered protein (designed N-1) which appears to be involved in early heart development. The protein is localized in tissues involved with early heart induction. Studies involve cellular and molecular analysis of the protein in normal and cardiac mutant axolotls.

Role: PI

RO1 HL061246 Lemanski (PI)
NIH/NHLBI 02/28/98-03/31/03

“Studies on a Novel RNA that Promotes Heart Development”

The studies of this proposal are designed to investigate a novel RNA derived from endoderm-conditioned medium has the ability to promote myofibrillogenesis in cardiac mutant axolotl heart cells and cause the usually-quiescent mutant heart to beat. The gene for the RNA is being cloned, sequenced and mutated to determine the mechanism of action in culture and to determine the active site(s).

Role: PI

Patent: Promoting Cardiac Cell Differentiation (US Provisional 60/462 171)

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Linkous, Clovus Alan	Senior Research Scientist Florida Solar Energy Center University of Central Florida 1679 Clearlake Rd. Cocoa, FL 32922-5703 407.638-1000 ext. 1447 calink@fsec.uscf.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Michigan State University	Ph.D.	1983	Chemistry
Purdue University	B.S.	1976	Chemistry & Physics

EMPLOYMENT HISTORY:

1990 - Present Senior Research Scientist, Florida Solar Energy Center
1989 - 1990 Senior Scientist, Electron Transfer Technologies, Princeton, NJ
1987 - 1989 Scientist, Brookhaven National Laboratory
1984 - 1987 Associate Scientist, Brookhaven National Laboratory
1982 - 1984 Assistant Scientist, Brookhaven National Laboratory
1978 - 1982 Research Associate, Department of Chemistry, University of Arizona.

Research interests:

- Kinetics and mechanisms of semiconductor particulate chemistry
- The organic solid state
- Fabrication and characterization of solid polymer electrolytes
- Batteries, fuel cells, electrolysis
- Hydrogen energy systems
- Electrochemistry and properties of superoxide ion

Awards:

1996 Outstanding Chemist Award, American Chemical Society, Orlando Section.
1994 Centers and Institutes Researcher of the Year, University of Central Florida.

Professional Affiliations

International Association for Hydrogen Energy
American Chemical Society
Electrochemical Society

Selected publications

1. R.W. Kopitzke, C.A. Linkous, and G.L. Nelson, "Thermal Stability of High Temperature Polymers and Their Sulfonated Derivatives under Inert and Saturated Vapor Conditions," *Polymer Degradation and Stability*, 67 (2000) 335-344.
2. R.W. Kopitzke, C.A. Linkous, H.R. Anderson, and G.L. Nelson, "Conductivity and Water Uptake of Aromatic-Based Proton Exchange Membrane Electrolytes," *J. Electrochem. Soc.*, 147 (2000) 1677-1681. "Conductivity and Water Uptake of Aromatic-Based Proton Exchange Membrane Electrolytes," *J. Electrochem. Soc.*, 147 (2000) 1677-1681.
3. R.W. Kopitzke, C.A. Linkous, and G.L. Nelson, "Sulfonation of a Poly(phenylquinoxaline) Film," *J. Polym. Sci., Part A: Polym. Chem.*, 36 (1998) 1197-99.
4. C.A. Linkous, H.R. Anderson, R.W. Kopitzke, and G.L. Nelson, "Development of New Proton Exchange Membrane Electrolytes for Water Electrolysis at Higher Temperatures," proceedings of the 11th World Hydrogen Energy Conference, June 23-28, 1996, Stuttgart, Germany, T.N. Veziroglu, C.-J. Winter, J.P. Baselt, and G. Kreysa, eds.
5. C.A. Linkous and A.T. Raissi, "Electrolytic Oxygen Enrichment Using Superoxide Ion in a Solid Polymer Membrane Electrolyte," Proceedings of the 31st Space Congress, Cocoa Beach, Florida, April 26-29, 1994, p.7-29 to 7-34.
6. C.A. Linkous, U.S. patent # 5,271,813, December 21, 1993. "Apparatus and Method for the Electrolysis of Water Employing a Sulfonated Solid Polymer Electrolyte."
7. C.A. Linkous, "Development of Polymeric Solid Electrolytes for Water Electrolysis at Intermediate Temperatures," *Int. J. of Hydrogen Energy*, 18 (1993) 641-646.
8. C.A. Linkous and D.K. Slattery, "Characterization of Sulfonic Acids of High Temperature Polymers as Membranes for Water Electrolysis," *Polymer Materials: Science and Engineering Preprints*, Spring 1993.
9. "An Electrochemical Study of 1-Methyl-4-Phenyl-1,2,3,6-Tetrahydropyridine and its Oxidation Products," C.A. Linkous, K.M. Schaich, A. Forman, and D.C. Borg, *J. Electroanal. Chem., Bioelectrochem. Bioenergetics*, 19 (1988) 477-490.
10. T.A. Skotheim, W.E. O'Grady, and C.A. Linkous, US patent #4,571,029; February 18, 1986. "Electro-optical Switching and Memory Display Device.
11. "Polypyrrole Complexed with Cobalt Phthalocyanine-a Conducting Polymer Which is Stable in Air and Moisture," T. Skotheim, M. Velazquez-Rosenthal, and C.A. Linkous, *J. Chem. Soc., Chem. Commun.*, (1985) 612-13.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Mahfuz, Hassan	Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 561.297.3483 hmahfuz@oe.fau.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Florida Atlantic University, Boca Raton, Florida	Ph.D.	1989	Mechanical Engineering
Florida Atlantic University	M.S.	1986	Mechanical Engineering
Bangladesh University of Engineering & Technology	B.S.	1975	Engineering

D. Positions and Honors

2005-present Professor of Ocean Engineering, Florida Atlantic University
 1997-2004 Professor of Mechanical Engineering, Tuskegee University
 1993-1997 Associate Professor of Mechanical Engineering, Tuskegee University
 1989-1993 Assistant Professor of Mechanical Engineering, Tuskegee University

Honors & Awards

The Russell W. Brown Distinguished Scientists Award, Sigma Xi Scientific Research Society (Tuskegee University), 2002.
 Faculty Achievement Award, 1998.
 Outstanding Faculty Award in Research, 1992.
 Professor of the Year, 1995.

B. Publications: 100 plus refereed papers, 95 technical presentations, and about 35 technical reports

(i) Closely related to the proposed research

1. Mahfuz, H., Adnan, A., Rangari, V.K., Hasan, M.M., Jeelani, S., Wright, W.J. and DeTeresa, S.J., "Enhancement of Strength and Stiffness of Nylon 6 Filaments through Carbon Nanotubes Reinforcements," *Applied Physics Letters*, 88, 083119 (2006).

2. Mahfuz, H., Thomas, T., Rangari, V. And Jeelani, S., "On the Dynamic Response of Sandwich Composites and their Core Materials," *Composites Science and Technology*, 66 (2006) 2465-2472.
3. Nathaniel C., Mahfuz, H., Rangari, V., Ashfaq, A. and Jeelani, S., "Fabrication and Mechanical Characterization of Carbon/Epoxy Nanocomposites," *Composite Structures*, 67 (2005) 115-124.
4. Rodgers, R., Mahfuz, H., Rangari, V., Chisholm, N., and Jeelani, S., "Infusion of Nanoparticle into SC-15 Epoxy; an Investigation of Thermal and Mechanical Response," *Macromolecular Materials & Engineering*, 2005, 290, 423-429.
5. Mahfuz, H., Adnan, A., Rangari, V., and Jeelani, S., "Manufacturing and Characterization of Carbon Nanotube/Polyethylene Composites," *International Journal of Nanoscience*, Vol. 4, No. 1 (2005) 1-18.

(ii) Five other significant publications

6. Mahfuz, H., Uddin, M.F., Rangari, V.K., Saha, M.C., Zainuddin, S. and Jeelani, S., "High Strain Rate Response of Sandwich Composites with Nanophased Cores," *Applied Composite Materials*, (2005) 12: 193-211.
7. Mahfuz, H., Rangari, V., Islam, M., and Jeelani, S., "Fabrication, Synthesis and Mechanical Characterization of Nanoparticles Infused Polyurethane Foams," *Composites Part A: Applied Science and Manufacturing*, Vol. 35 (2004) 453-460.
8. Mahfuz, H., Rangari, V., Adnan, A, and Jeelani, S," Carbon Nanoparticles/Whiskers Reinforced Composites and their Tensile Response," *Composites Part A: Applied Science and Manufacturing*, Vol. 35 (2004) 519-527.
9. Mahfuz, H., Majumdar, P., Saha, M. and Jeelani, S., "Integral Manufacturing of Composite Skin-Stringer Assembly and their Stability Analyses," *Applied Composite Materials*, 11 (3): 155-171, 2004.
10. Mahfuz, H., Islam, M., Rangari, V., Saha, M. and Jeelani, S., "Response of Sandwich Composites with Nanophased Cores under Flexural Loading," *Composites Part B: 35* (2004) 543-550.

C. Synergistic Activities

1) PI/Co-PI of the following grants/contracts in nanomaterials area

- "Synthesis, Manufacturing and Characterization of Structural Nanocomposites", National Science Foundation (CREST), (\$4.5 million, 9/03-8/08), Co-PI
 - "Nano-phased Composites for Marine Structures", U. S. Navy, Office of Naval Research, (\$994,000, 2/02-9/07), PI
 - "Development of Flexible Extremities Protection utilizing Shear Thickening Fluid/Fabric Composites," Army Research Office (ARO), Battlefield Capability Enhancement (BCE) program, (\$2.325 million, 10/04 – 9/09), PI
- 2) Keynote Lecture** on "Recent Advances in Structural Nanocomposites," 2nd BSME-ASME International Conference, January 2-4, 2004, Dhaka, Bangladesh.
- 3) Invited Paper** on "Characterization of Nanophased Carbon Prepeg Laminates," presented at COMPOSITES 2004 sponsored by The American Composites Manufacturers Association (ACMA), October 6-8, 2004, Tampa, Florida.
- 4) Program Coordinator**, Alabama EPSCoR Conference held jointly with NSF Nanoscale Science and Technology Conference, January 18-19, 2001, Tuskegee University, Tuskegee, AL.

5) **Colloquium** on “Nanoparticle Infusion into Structural Polymers and the Influence of Magnetic Flocculation,” at the Department of Aerospace and Astronautics, Purdue University on December 2, 2004.

D. Collaborators and Graduate Students

- (i) **Collaborators:** C.T. Sun – Purdue University, Alan Friedman – Purdue University, Young Huang – University of Illinois at Champaign, Fu-Pen Chiang – SUNY at Stony Brooke, George Kardomateas – Georgia Tech, Steve DeTeresa – Lawrence Livermore Lab, Leif Carlsson – Florida Atlantic University, Martin Parker – University of South Alabama, J.J. Dong – Auburn University, Namas Chandra – Florida State University, John Gillespie – University of Delaware, Melissa Hines – Cornell University.
- (ii) Ph. D. Thesis Advisor: Robert O. Case (FAU)
- (iii) **Graduate Students:**

Ph.D: Tonnia Thomas (2003, Meads Corporation) and Krishnan Kanny (2003, University of Natal, South Africa), Nathaniel Chisholm (DeKalb County, Atlanta, GA)

MS: Yu Ting Xing (1991, Ford), Partha S. Das (1992, Honeywell), Dongwei Xue (1992, FEDEX), Cynthia R. Ingram (1993, Purdue), George Grant (1993, Ford), M. Maniruzzaman (1993, WPI), Mrinal K. Saha (1995, ODU), Ahsan Miah (1994, Auburn), Daixu Yu (1995), Timothy D. Brown (1996, Army), David Lord (1995), Camille Watkins (1995, Ford), Roshan Raines (1996, GM), Robert Harris (1996, Army), Bazle Gama (1997, UD), Alicia Grant (1997, GM), Khalid Eltom (1998, Adelphi), Mojibur Rahman (1998, Johnson Controls), Alope K. Pal (1999), M. Kamruzzaman (2000), Yuhui Zhu (2000), Wahid A. Mamun (2000, Purdue University), Syful Islam (2001), Chinmoy Joarder (2002), Nitin Kulkarni (2002), Mohamad Gamaleldin (2002), ABM Khalid Hasan (2002, Visteon), Mohammad Mostafizur Rahman (2003, UD-CCM), Uttam Chakravarty (2003, Georgia Tech), and Mohammad Sadikul Islam (2003, UD-CCM), Prasun Majumdar (2003, Virginia Tech), Adnan Ashfaq (2003, Purdue University), and Mohammed F. Uddin (2004, Purdue University), Justice Nana (2004, Wayne State University), Mohammed A. Baseer (2005), Shaik Zainuddin (2005, Tuskegee)

Total Number of Graduate Students: Past-**39** (Ph.D.-3, M.S.-36), present-**4** (Ph.D.-2, M.S.-2).

BIOGRAPHICAL SKETCH

NAME Messing, Charles Garrett	POSITION TITLE Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3658 messing@nsu.nova.edu
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Rosenstiel School of Marine & Atmospheric Science, University of Miami, Coral Gables, FL	PhD	1979	Biological Oceanography
Rosenstiel School of Marine & Atmospheric Science, University of Miami, Coral Gables, FL	MS	1975	Biological Oceanography
Rutgers, The State University, New Brunswick, NH	BA	1970	Biological Science

Recent Professional Scientific Experience

2000-present Professor, Nova Southeastern Univ. Oceanographic Center, Dania Beach, FL
 1994-2000 Adjunct Assoc. Prof., Dept. Geological Science, Univ. Miami, Coral Gables, FL
 1993-2000 Associate Professor, Nova Southeastern Univ. Oceanographic Center, Dania, FL
 1990-1993 Assistant Professor, Nova University Oceanographic Center, Dania, FL
 1987-1993 Adjunct Asst. Prof., Dept. Geological Science, Univ. Miami, Coral Gables, FL
 1987-1990 Research Associate, Nova University Oceanographic Center, Dania, FL

Recent Awards

Visiting Scientist, Museum National d'Histoire Naturelle, Paris (1994-6, 1998, 2001, 2005)
 Visiting Scholar, University of Sydney (2001)

Memberships

Paleontological Society	Sigma Xi
Biological Society of Washington	Geological Society of America
National Center for Science Education	

Recent Peer-reviewed Scientific Book and Journal Articles (of 42 total)

Baumiller, T.K., Gahn, F.J., Hess, H., and Messing, C.G. in press. Taphonomy as a guide to the behavior of extinct stalked crinoids. In Ausich, W.I., and Webster, G. (eds.), *Echinoderm Paleobiology*. Indiana University Press, Bloomington.

David, J., Roux, M., Messing, C.G. & Améziane, N. 2006. Revision of the pentacrinid stalked crinoids of the genus *Endoxocrinus* (Echinodermata, Crinoidea), with a study of environmental control of characters and its consequences for taxonomy. *Zootaxa* 1156:1-50

- Messing, C.G., Meyer, D.L., Siebeck, U., Jermini, L.S., Vaney, D.I. & Rouse, G.W. 2006. A modern, soft-bottom, shallow-water tropical crinoid fauna (Echinodermata) from the Great Barrier Reef. *Coral Reefs* 25(1):164-168.
- Wirshing, H.H., Messing, C.G., Douady, C.J., Reed, J., Stanhope, M.J., & Shivji, M.S. 2005. Molecular evidence for multiple lineages in the gorgonian family Plexauridae (Anthozoa: Octocorallia). *Marine Biology* 147: 497-508.
- Messing, C. G. 2004. Biozonation on deep-water carbonate mounds and associated hardgrounds along the western margin of Little Bahama Bank, with notes on the Caicos Platform island slope. Pp. 107-115 IN Lewis, R.D. & Panuska, B.C. (eds.) *11th Sympos. Geol. Bahamas and other Carbonate Regions*, Gerace Research Center, San Salvador, Bahamas.

Recent Abstracts of Oral Presentations

- Brooke, S.D., Messing, C.G., Reed, J.K. & Gilmore, R.G. 2006. Exploration of deep-sea coral ecosystems along the east coast of Florida. 11th Intl. Deep-Sea Biology Symposium, Southampton, UK.
- Neumann, A.C. & Messing, C.G. 2006. The geological and biological characteristics of lithoherms. Soc. Sedimentary Geology (SEPM) short course no. 19, Quaternary Reefs and Platforms: Bridging the Gap between the Ancient and the Modern, 13-14 Apr, 2006 AAPG Annual Convention, Houston.
- Messing, C.G., Moyer, R.P., Walker, B.K., Dodge, R.E. & Shaul. 2005. Distribution of Deep-Water Corals on the Western Margin of Little Bahama Bank, Bahama Islands. Third International Deep-Sea Corals Symposium, 28 Nov-2 Dec, Miami.
- Baumiller, T.K. & C.G. Messing. 2005. Crawling in stalked crinoids: observations, functional morphology, and implications for Paleozoic taxa. Geol. Soc. Am. Ann. mtg, Salt Lake City.
- Messing, C.G., Moyer, R.P., Walker, B.K., Dodge, R.E. & Shaul, R. 2004. Distribution and biozonation of Anthozoa along the southwestern margin of Little Bahama Bank. AGU Ocean Sciences Meeting, Portland, OR, 26-30 Jan.

Recent Grants and Contracts (Principal Investigator except where noted)

- Deep-water Marine Benthic Video Survey, Calypso U.S. Pipeline, LLC, Mile Posts 31-0 (\$87,000)
- Marine Benthic Video Survey, Suez Energy NA, Calypso Florida DWP Project (\$87,000)
- NSU President's Faculty Research & Development Grant, FY 2006-2007. Quantitative analysis of deep-sea coral habitat structure: east coast of Florida (\$8,250)
- Mapping and Characterization of Deep Sea Coral Ecosystems off the Coast of Florida. NOAA OE. Nov 2005-Oct 2006 (Co-Principal Investigator; Sandra D. Brooke, P.I., \$101,571).
- Tractebel/Blue Marlin natural gas pipeline biological habitat survey, 0-200 m depth, off Freeport, Grand Bahama Island. Ecology & Environment, Inc. Jun 2003-Jun 2007 (Co-investigator; R.E. Dodge, P.I., \$217,401).
- URS Tractebel/Calypso natural gas pipeline biological habitat survey, 65-200 m depth, off Fort Lauderdale, FL. URS Corp., Miami Springs, FL 33166 Jun 2003-Jun 2004 (Co-investigator; R.E. Dodge, P.I., \$261,950).
- Environmental and taxonomic control of growth, morphology, taphonomy and sediment production in living stalked crinoids (Echinodermata). National Science Foundation EAR-9628215. Sep 1996 - Jun 1999. (\$49,786).

Recent Television and Video Experience

2003-2005 *The Sherlock Project: Investigating the Natural World* (co-producer, writer and co-host). A an interactive science education television show for middle school students produced in partnership with the Broward School Board and Broward Educational Communications Network (BECON). Bruce Tuthill, Director (754-321-1000).

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Mittal, Vishal O.	Post Doctoral Associate Florida Solar Energy Center University of Central Florida 1679 Clearlake Rd. Cocoa, FL 32922-5703 vmittal@fsec.ucf.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Connecticut, Storrs, CT	Ph.D.	2006	Chemical Engineering
Birla Institute of Technology and Science, India	B.E.	2002	Chemical Engineering

Professional Experience

June 06 – Present	Post Doctoral Associate, Florida Solar Energy Center, FL
Jan. 05 – May 06	Research Assistant, University of Connecticut, CT
Jan. 04 - Dec. 04	Research Intern, UTC Fuel Cells, South Windsor, CT
Jan. 02 - July 02	Intern, Satyam Computer Services Ltd., Hyderabad, India

Relevant Publications

- Mittal, V., C. H. Paik, S. Motupally, and T. D. Jarvi, "Role of Anode and Cathode in Membrane Decay in PEMFC", *J. Electrochem. Soc.*, To be submitted
- Mittal, V., H. R. Kunz and J. M. Fenton, "Membrane Degradation Mechanisms in PEMFCs",
- Submitted to *ECS Transaction 210th Meeting of the Electrochemical Society, Cancun, Oct. 2006.*
- Mittal, V., H. R. Kunz and J. M. Fenton, "Effect of Catalyst Properties on Membrane Degradation Rate and the Underlying Degradation Mechanism in PEMFCs", *J. Electrochem. Soc.*, **153**, A1755 (2006).
- Mittal, V., H. R. Kunz and J. M. Fenton, "Is H₂O₂ Involved in the Membrane Degradation Mechanism in PEMFC?" *Electrochemical and Solid-State Letters*, **9**, A299 (2006).
- Mittal, V., R. Zaffou, H. R. Kunz and J. M. Fenton, "Impact of Membrane-Electrode Assembly Fabrication Technique on PEM Fuel Cell Performance, *Proceedings of the 206th Meeting of the Electrochemical Society, Honolulu, Oct. 2004*

Professional Affiliation: Electrochemical Society
American Chemical Society

Advisor: Vishal Mittal's Ph.D. Dissertation was supervised by Professor J. M. Fenton at the University of Connecticut, 2002-2006.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Muradov, Nazim Z.	Principal Research Scientist Florida Solar Energy Center University of Central Florida 1679 Clearlake Rd. Cocoa, FL 32922-5703 321.638.1448 maradoz@fsec.ucf.edu

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Institute of Chemical Physics, Moscow, Russia	Ph.D.	1990	Physical Chemistry
Institute of Chemical Physics, Moscow, Russia	Ph.D.	1975	Kinetics & Catalysis
Institute of Oil and Chemistry, Azerbaijan	M.S.	1970	Petrol/Chemical Engineering

Employment:

1990-Present Principal Research Scientist, Florida Solar Energy Center, UCF.

1970-1990 Principal Research Scientist, Inst. Petrochemical Processes, Baku, Azerbaijan.

Professional Societies:

- Member of the American Chemical Society and International Association for Hydrogen Energy.

Awards:

- UCF (Institutes and Centers) Distinguished Researcher of the Year Award, 1996.
- UCF Research Incentive Award, 2003.

Publications, Patents and Professional Presentations:

- Author and co-author of more than 160 publications (including 56 refereed publications).
- Author and co-author of 24 issued patents (4 patents pending before U.S.PTO).
- Presented papers at 60 national and international meetings (including invited presentations and lectures in U.S., Japan, Turkey, Spain and Saudi Arabia).

Synergistic Activities

- Member of the Editorial board of the *International Journal of Hydrogen Energy* and the Intern. Editorial Board of the *Processes of Petrochemistry and Oil Refining* (ANAS).

Chaired and co-chaired technical sessions at X and XII World Hydrogen Energy Conferences (1994 and 1998) and American Chem. Society meetings (1993 and 1994).

- Reviewer for a number of international journals (*Intern. Journal of Hydrogen Energy, Solar Energy Eng., Fuel, Ind. & Eng. Chem. Res., Energy & Fuel, Environ. Science and Technology, Catalysis Communications*).
- Member of Scientific and Organizing Committee of 2nd *European Hydrogen Energy Conference*, Zaragoza, Spain, 2005.
- Member of the national grant review panel for the U.S. Department of Agriculture.
- Member of the UCF Commission on Nanoscale Science and Technology.

List of Selected Publications and Patents (out of 180):

1. **Muradov, N.**, Smith, F., T-Raissi, A. "Autothermal catalytic pyrolysis of methane as a new route to hydrogen production with reduced CO₂ emissions", *Catalysis Today*, 116, 281-288 (2006).
2. **Muradov, N.**, Smith, F., T-Raissi, A. "Decentralized Production of Hydrogen from Hydrocarbons without CO₂ Emission", *World Hydrogen Energy Conf., Lyon, France, 2006*.
3. **Muradov, N.**, Smith, F., T-Raissi, A. "Hydrogen Production via Catalytic Processing of Renewable Feedstocks", *World Hydrogen Energy Conf., Lyon, France, 2006*.
4. **Muradov, N.**, Chen Z., Smith F., "Hydrogen from Fossils with Reduced CO₂ Emissions: Modeling Fluidized Bed of Carbon Particles", *IJHE*, 30, 1149-1158 (2005).
5. **Muradov, N.**, Veziroglu, N., "From Hydrocarbon to Hydrogen-Carbon to Hydrogen Economy", *International Journal of Hydrogen Energy*, v.30 (3), pp. 225-237 (2005).
6. **Muradov, N.**, Smith, F., T-Raissi, A. "Catalytic Activity of Carbons for Methane Decomposition Reaction", *Catalysis Today*, v. 102-103 (2005) 225-233.
7. **Muradov, N.**, Smith, F., T-Raissi, A. "Catalytic Properties of Carbons in Methane Decomposition Reaction", *International Symposium on Carbon for Catalysis*, Lausanne, Switzerland, 2004.
8. **Muradov, N.**, T-Raissi, A., Robertson, T. "Hydrogen Production via Catalytic Reforming of Low-quality Methane Containing Feedstocks", *HYPOTHESIS*, Eds. M. Marini, G. Spazzafumo, SG Editoriali, Padova, Italy, 2003, pp. 191-9.
9. **Muradov, N.**, Smith, F. "Thermocatalytic Hydrogen Production from Natural Gas with Drastically Reduced CO₂ Emissions", *Hydrogen Power Theoretical and Engineering Solutions (HYPOTHESIS)*, Eds. M. Marini, G. Spazzafumo, SG Editoriali, Padova, Italy, 2003, pp.87-95.
10. **Muradov, N.**, T-Raissi, A., Smith, F., Elbaccouch, M. "Hydrogen Production via Catalytic Reforming of Landfill Gas and Biogas", *XV WHEC*, Yokohama, Japan, 2004.
11. Huang, C., **Muradov, N.**, T-Raissi, A. "Analysis of Liquid Hydrogen Production from Methane and Landfill Gas", *XV World Hydrogen Energy Conf.*, Yokohama, Japan, 2004.
12. **Muradov, N.** "Three-dimensional Carbon Fibers and Method and Apparatus for Their Production", *US Patent No. 6,787,229 B1*, Sept. 7, 2004.
13. **Muradov, N.**, "Thermocatalytic Process for CO₂-free Production of Hydrogen and Carbon from Hydrocarbons", *U.S. Patent No. 6,670,058 B2* (2003).
14. **Muradov, N.**, "Portable Hydrogen Generator-Fuel Cell Apparatus", *U.S. Pat. # 6,653,005 B1* (2003).
15. **Muradov, N.**, "Emission-free Reformers for Mobile and Portable Fuel Cell Applications", *Journal of Power Sources*, 5236, 1-5(2003).
16. **Muradov, N.**, Schwitter, A. "Formation of Conical Carbon Structures by Non-catalyzed Chemical Vapor Deposition", *Nano Letters*, v.2, No.6, pp.673-676, 2002.
17. **Muradov, N.** "Catalytic Conditioning of Sulfurous Hydrocarbon Fuels for Fuel Cell Applications", *Symposium: Fuel Clean-up Considerations for Fuel Cells, ACS Meeting*, New Orleans, 2003.
18. **Muradov, N.** "Hydrogen via Methane Decomposition: an Application for Decarbonization of Fossil Fuels", *International Journal of Hydrogen Energy*, v.26, 1165, 2001.
19. **Muradov, N.** "Catalysis of Methane Decomposition over Elemental Carbon", *Catalysis Communications*, No.2, 89, 2001.

Research Areas: Thermocatalytic and photocatalytic hydrogen production. Fossil fuel decarbonization. Hydrocarbon processing. Catalytic activation of alkanes. Catalytic conversion of solar energy. Radiant detoxification of hazardous wastes. Nanostructured carbon materials. Hydrogen sensors.

Research Experience (1990-):

- Local production of hydrogen from fossil and renewable sources (NASA, GRC)
- Visual hydrogen leak detectors (NASA, GRC)
- Thermocatalytic hydrogen production technologies (U.S. DOE).
- Modeling of integrated renewable energy based utility systems (DOE, Energy Partners, Inc.)
- Fuel cell validation and quantification (Applica Consumer Products, Inc.)
- Solar photocatalytic production of hydrogen from aqueous sulfide solutions (EPA, GCHRC)
- UV-radiant detoxification of nitroglycerine vapors and VOCs (U.S. DOD, Navy)
- Photolysis of COS/CO Emissions (EPA, DuPont)
- FTIR characterization of explosive destruction products (U.S. DOD, ONR)
- Hydrocarbon cracking and catalyst decoking (Procyon Power Systems, Inc.)

BIOGRAPHICAL SKETCH

NAME Stephen G. Nappi	POSITION TITLE Interim Assistant Vice President for Research and Director of Technology Transfer
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EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Florida Atlantic University, Boca Raton, FL	BBA	1998 - 2002	Management and Marketing
Florida Atlantic University, Boca Raton, FL	MBA Coursework	In Progress	Finance
Associate of University Technology Managers, Chicago, IL	Certificate	2004	Licensing

A. Employment

2006 - Present Interim Assistant Vice President for Research and Director of Technology Transfer, Florida Atlantic University, Boca Raton, FL

2005 -2006 Assistant Director of Technology Transfer, Florida Atlantic University, Boca Raton, FL

2001 - 2005 Coordinator of Technology Transfer, Florida Atlantic University, Boca Raton, FL

B. Relevant Publications and Presentations

Presentation Author: “Partnering with Universities and SBIR/STTR Grant Basics,” Accelerating Innovation through Entrepreneurship Symposium, 8/06

Presentation Author: “Universities Collaborations,” SBIT/STTR Workshop for Entrepreneurs, 6/06

Presentation Author: “Advances in Imaging Technology,” Florida Technology Transfer Conference, 4/06

C. Accomplishments and Honors

Co-creator, FAU Gap Funding Program, 8/06

Interim Chair, FAU Intellectual Property Committee, 6/06 – present

Creator, Intellectual Property Management System used by FAU, licensed to University of North Florida, 2002

D. Memberships and Associations

Association of University Technology Managers, 2002 – present

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Pantelakis, Thomas	Coordinator of Research Programs and Services Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, FL 33004-3023 954.924.7112

E. Positions and Honors.

Thomas Pantelakis is the coordinator of research programs and services at the Ocean Engineering department of Florida Atlantic University, where he is responsible for the OE Electronics Lab and the development of analog and digital hardware, as well as firmware and embedded software, for a wide variety of the university's Ocean Engineering projects. He has over 40 years of experience in electronics design work for a broad range of applications, of which the last 11 years were spent at FAU's Ocean Engineering department, with emphasis on product development for underwater applications.

F. Skills and Area(s) of Expertise.

I established a professional Electronics Department in the Ocean Engineering department at SeaTech. This Electronics Department aided greatly in the completion of many research projects. This included circuits designed for Advanced Marine Systems / AUV, Acoustic Systems, Marine Materials and Hydrodynamics. Designed innovated electronics circuits in a timely professional manner. This included over 30 new electronics circuits and systems for various research projects in the first few years.

I also provided a working example of a professional electronics design environment for the research students. Advised students in the uses of CAD software for top down design with good documentation. Provided CAD circuit board design stations for student projects and trained the students how to go from an initial concept to a working circuit board design. Supplied a library of data books with component information and many electronics components to build their circuits. Aided students in the understanding and operation of test equipment needed to check their design projects.

G. Research Project Support.

Accomplishments 7/1/04 to 6/30/05:

The OE Electronics Lab supported numerous departments with various electronic needs which included: helped students with their research and design, provided electronic designs for several ONR projects and provided maintenance on electronic equipment.

I finished the Docking Station System Project. This involved the assembly, system integration and testing of the complete AUV Docking System. The system was pool tested with complete success. It demonstrated a 1000 Watt Inductive Coupled Power Transfer with 83% efficiency (which is excellent for an end to end power transfer system) and a High Speed Ethernet Data Transfer. Several companies are interested in licensing this technology.

I finished the A Size Buoy Project. This consisted of three major tasks, the Self Mooring Module Design Phase III, the NavCom2 payload Phase II and the New Intelligent Battery Controller. All three tasks involved software design, electronic circuit design, mechanical design, assembly, testing and debugging. Several A Size Buoys were demonstrated at ONR's last AUV Fest with great success.

I supported several NSF funded REU students with their projects. This included software design, circuit design and testing. I designed a New Micro Controlled Circuit Board, for a Surface Vehicle, which enabled one of the REU students to install his Designed Software.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Presuel-Moreno, Francisco J.	Assistant Professor of Ocean Engineering Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 954.924.7236 fpresuel@fau.edu

EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Autonomous University of Yucatan, Merida Mexico	B.S.	1993	Engineering
University of South Florida, Tampa FL	Ph.D.	2002	Engineering Science

NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-page limit. Follow the formats and instructions on the attached sample.

A Positions and Honors.

Positions and Employment

July 2006- Assistant Professor, Dept. of Ocean Engineering, Florida Atlantic University
 2005-2006 Research Scientist, University of Virginia
 2002-2005 Research Associate, University of Virginia
 1995-2002 Graduate Research Assistant, University of South Florida
 1998 Assistant, University of South Florida
 1992-1994 Programmer Analyst/Supervisor, Computer Center of the Government of Yucatan, Mexico

Honors and Awards

CONACYT/Mexico Scholarship Recipient 1994-1999, Doctoral Studies in U.S.A.

B. Selected peer-reviewed publications.

1. *J. Presuel-Moreno*, H. Wang, M. A. Jakab, R. G. Kelly, and J. R. Scully, "Computational Modeling of Active Corrosion Inhibitor Release from an Al-Co-Ce Metallic Coating: Protection of Exposed AA2024-T3" , *J. Electrochemical Soc.* 153 (11) B4XX, 2006 (In press)

2. M.A. Jakab, *F. Presuel-Moreno*, J.R. Scully, “Effect of molybdate, cerium, and cobalt ions on the oxygen reduction reaction on AA2024-T3 and selected intermetallics”, *J. Electrochemical Soc.* 153 (7) B244-B252, 2006
3. Cui, *F. J. Presuel-Moreno*, R. G.; Kelly, Experimental and computational evaluation of the protection provided by an aluminum cladding to AA2024-T3 exposed at a seacoast environment. *Corrosion* V 62 (3) pp. 251-263, 2006
4. F. Cui, *F.J. Presuel-Moreno*, R. G.; Kelly, Computational modeling of cathodic limitations on localized corrosion of wetted SS 316L at room temperature. *Corrosion Science* V 47(12), 2987-3005, 2005
5. F. Cui, *F.J. Presuel-Moreno*, R.G. Kelly,” Computation Modeling of Localized Corrosion Stability on Wetted SS316L at 25 and 95 °C”, *ECS Trans.* 1, (16) 17 (2006)
6. *F. Presuel*, M. Jakab, and J.R. Scully, “Inhibition of the Oxygen Reduction Reaction on Copper with Cobalt, Cerium, and Molybdate Ions”, *J. Electrochemical Soc.* V. 152 (9) B376-B387, 2005
7. *F. Presuel*, M. Goldman, J. Scully, and R. Kelly “Modeling of Electrochemical Sacrificial Cathodic Prevention Provided by a Novel Al-Ce-Co Metal Coating Coupled to AA-2024 Under Atmospheric Conditions”, *J. Electrochemical Soc.*, V. 152 (8) B302-B310, 2005
8. *F.J. Presuel-Moreno*, S.C. Kranc, and A.A. Sagüés “Cathodic Prevention Distribution in Partially Submerged Reinforced Concrete” *Corrosion* V 61 (6) pp 548-558, 2005
9. *F.J. Presuel-Moreno*, A.A. Sagüés, and S.C. Kranc “Steel Activation in Concrete Following Interruption of Long-Term Cathodic Polarization” *Corrosion* V 61 (5) pp 428-436, 2005
10. M.A. Jakab, *F. Presuel-Moreno*, J.R. Scully, “Critical concentrations associated with cobalt, cerium, and molybdenum inhibition of AA2024-T3 corrosion: Delivery from Al-Co-Ce(-Mo) alloys” *Corrosion* V 61 (3) pp 246-263, 2005
11. Wang, *F. Presuel*, R.G. Kelly, “Computational modeling of inhibitor release and transport from multifunctional organic coatings” *Electrochimica Acta* V 49 pp 239-255, 2004
12. S.C. Kranc, A.A. Sagüés and *F. J. Presuel* “Decreased Corrosion Initiation Time of Steel in Concrete Due to Rebar Obstruction of Diffusional Flow”, *ACI Materials Journal*, Vol 99 (1) pp 51-53, 2002.

BIOGRAPHICAL SKETCH

NAME Purkis, Samuel J.	POSITION TITLE Assistant Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Southampton, England	BSc Hons	1998	Oceanography & Marine Biology
Vrije Universiteit Amsterdam, The Netherlands	MS	2002	Earth Sciences/Geology
Vrije Universiteit Amsterdam, The Netherlands	PhD	2004	

Appointments

- 2004 - present Research Scientist, National Coral Reef Institute, Oceanographic Center, Nova Southeastern University Dania Beach FL.
- 2000 - 2004 Ph.D. Student, Vrije Universiteit, Amsterdam, The Netherlands
- 2003 - 2003 Interim-ESSAC science coordinator for the Ocean Drilling Project
- 2001 - 2003 Science Coordinator for the European Science Committee for the Ocean Drilling Project (ESCO), Vrije Universiteit, Amsterdam, The Netherlands
- 1998 - 1999 Visiting Scientist, National Research Council of Thailand, Bangkok

Relevant Publications

5 publications most closely related to the proposed project:

Purkis SJ, Myint S, Riegl B (in review) Enhanced detection of the coral *Acropora cervicornis* from satellite imagery using a textural operator. Remote Sensing of Environment

Purkis SJ, Riegl B, Andréfouët S (2005) Remote sensing of geomorphology and facies patterns on a modern carbonate ramp (Arabian Gulf, Dubai, U.A.E.). Journal of Sedimentary Research 75:859-874

Purkis SJ (2005) A “reef-up” approach to classifying coral habitats from IKONOS imagery. IEEE Transactions on Geoscience and Remote Sensing 43:1375-1390

Purkis SJ, Riegl B (2005) Spatial and temporal dynamics of Arabian Gulf coral assemblages quantified from remote-sensing and *in situ* monitoring data. Marine Ecology Progress Series 287:99-113

Purkis SJ, Pasterkamp J (2004) Integrating *in situ* reef-top reflectance spectra with Landsat TM imagery to aid shallow-tropical benthic habitat mapping. Coral Reefs 23:5-20

5 significant other publications:

Purkis SJ, Kenter JAM, Oikonomou EK, Robinson IS (2002) High-resolution ground verification, cluster analysis and optical model of reef substrate coverage on Landsat TM imagery (Red Sea, Egypt). *International Journal of Remote Sensing* 23:1677-1698

Purkis SJ (2004) Calibration of satellite images of reef environments. Ph.D. Thesis, Vrije Universiteit, Amsterdam, 205 pp. ISBN 90-9018043-5

Riegl B, Purkis SJ (2005) Detection of shallow subtidal corals from IKONOS satellite and QTC View (50, 200 kHz) single-beam sonar data (Arabian Gulf; Dubai, UAE). *Remote Sensing of Environment* 95:96-114

Riegl B, Moyer RP, Morris LJ, Virnstein RW, Purkis SJ (in press) Distribution and seasonal biomass of drift macroalgae in the Indian River Lagoon (Florida, USA) estimated with acoustic seafloor classification (QTCView, Echoplus). *Journal of Experimental Marine Biology and Ecology*

Keck J, Houston RS, Riegl B, Purkis SJ (in press) Unexpectedly high cover of *Acopora cervicornis* on offshore reefs in Roatán (Honduras). *Coral Reefs*

Synergistic Activities

2004-2005: Development of tools to enable analysis of the geospatial properties of modern carbonate depositional systems at landscape scale (e.g. Purkis & Riegl 2005; Purkis et al. 2005). I have developed a suite of spatial metrics relevant to the quantitative analysis of classified high-resolution satellite data, in an effort to resolve information pertaining to the ecological dynamics of the landscape. The link between satellite data and ecology has traditionally been problematic due to the coarse resolution offered by today's sensors. The use of spatial techniques shows promise to circumnavigate this disjunct.

2004-2005: I have tested a strategy whereby water column correction of satellite data is implemented using an independently collected measure of bathymetry combined with radiative transfer modelling, to process the satellite imagery to units of substrate reflectance (Purkis & Pasterkamp 2004; Purkis 2005). Image classification is subsequently driven using statistics derived from *in situ* optical measurements and therefore independent from the imagery. A principal advantage of this strategy is that the *in situ* spectra can be used retrospectively to train alternative remote sensing instruments of differing spectral resolution without the need for a repeat field campaign to collect ground-truth data.

2003-2005: Investigation into the use of active remote sensing systems for seabed classification. I have numerous projects using vessel-based acoustic systems (QTC, Echoplus & RoxAnn) and have been working to ascertain their ability to discriminate reef structure (Riegl & Purkis 2005). I am also involved in the testing of airborne Lidar technologies and am presently collaborating with John Brock of the USGS for the evaluation of the NASA-EAARL instrument while working with a team evaluating the recently released Optech Lidar / CASI fusion sensor. I have particular interest in the use of spatial metrics to identify habitat on the basis of seabed fractal, rugosity and variance signatures (Purkis et al., submitted).

2003-2005: During my appointment in the Netherlands and for my present position with the National Coral Reef Institute I continue to develop and teach graduate level courses in remote sensing and GIS technology. I am currently developing a distance-based curriculum that will be

taught solely online. The development of software tools and interactive tutorials to accompany this course are particularly interesting.

2000-2003: I held a position as the Science Coordinator for the European Science Committee for the Ocean Drilling Project (ESCO). The position involved the coordination of scientific and logistic issues for the 12 European countries who form the ECOD consortium with a yearly budget of 3 million €'s. As of Oct. 1st 2003 I acted as the interim ESSAC science coordinator, an organisation under which the European members of the 'International' ODP (IODP) operate. Annual budget for the consortium was approximately 12 million €'s.

Collaborators & Co-editors

Dodge R (Nova Southeastern University Oceanographic Center, USA)

Kenter J (Dept. Sedimentology, Vrije Universiteit Amsterdam, Netherlands)

Myint S (Department of Geography, University of Oklahoma, USA)

Pasterkamp R (Institute for Environmental Studies, Vrije Universiteit Amsterdam, Netherlands)

Riegl B (Nova Southeastern University Oceanographic Center, USA)

Graduate & Postdoctoral advisors

Prof. Wolfgang Schlager (Ph.D. promoter) Vrije Universiteit Amsterdam, Netherlands

Dr. Jeroen Kenter (Ph.D. co-promoter) Vrije Universiteit Amsterdam, Netherlands

Prof. Bernhard Riegl (principal postdoctoral advisor)

BIOGRAPHICAL SKETCH

NAME Rehage, Jennifer S.	POSITION TITLE Assistant Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3654 rehage@nova.edu
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Florida International University, Miami, FL	BS	1995	Environmental Studies
University of Kentucky, Lexington, KY	PhD	2003	Ecology, Evolution and Behavior Section, Biological Sciences

PROFESSIONAL EXPERIENCE

2006 - Present Assistant Professor, Oceanographic Center, Nova Southeastern University

2005 -2006 Postdoctoral Fellow, U.S. Geological Survey and Florida International University, Miami, FL. Advisors: William F. Loftus and Joel C. Trexler.

2003 - 2004 Postdoctoral Fellow, Biological Sciences, Florida International University, Miami, FL.
 Advisor: Joel C. Trexler.

2001 - 2003 Research Assistant, Environmental Science and Policy, University of California, Davis, CA. Advisor: Andrew Sih.

1999-2002 National Science Foundation Fellow, University of Kentucky, Lexington, KY.

FELLOWSHIPS AND AWARDS

National Science Foundation Graduate Research Fellowship, 1999-2002..

National Science Foundation Graduate Research Training Fellowship, University of Kentucky, 1998 -1999.

RESEARCH FUNDING

W.F. Loftus, J.S. Rehage, and S.E. Liston. U.S. Geological Survey Park-Oriented Biological Support: An evaluation of the impact of two introduced cichlids on native fish communities in Everglades wetlands, 2006, \$ 40,000.

W.F. Loftus, J.C. Trexler, and J.S. Rehage. U.S. Geological Survey and National Park Service Critical Ecosystem Studies Initiative: Introduced fishes in short-hydroperiod wetlands: evaluation of sampling, status, and potential effects, 2005, \$ 30,130.

A. Sih, P. Crowley, and J.S. Rehage. Doctoral Dissertation Improvement Grant, National Science Foundation: Traits underlying invasiveness: A comparison of widespread and endemic species in the genus *Gambusia*, 2002-2003, \$ 10,000.

E.C. and C.E. Raney Award, American Society of Ichthyologists and Herpetologists, 2001, \$ 200.

Endowment Research Award, North American Benthological Society, 2001, \$ 700.

National Science Foundation Doctoral Fellowship Research and Travel Funds, 1999-2002, \$ 1,500 each year.

RESEARCH PUBLICATIONS

Rehage, J.S. and W.F. Loftus. Accepted pending revisions. Seasonal fish community variation in mangrove creeks in the southwestern Everglades: an examination of their role as dry-down refuges. *Bulletin of Marine Science*.

Rehage, J.S. and J.C. Trexler. 2006. Assessing the net effect of anthropogenic disturbance on aquatic communities in wetlands: Community structure relative to distance from canals. *Hydrobiologia* 569:359-373.

Rehage, J.S., B.K. Barnett, and A. Sih. 2005. Foraging behavior and invasiveness: Do invasive *Gambusia* exhibit higher feeding rates and broader diets than their non-invasive relatives? *Ecology of Freshwater Fish* 14: 352-360.

Rehage, J.S., B.K. Barnett, and A. Sih. 2005. Behavioral responses to a novel predator and competitor of invasive mosquitofish and their non-invasive relatives (*Gambusia* sp.). *Behavioral Ecology and Sociobiology* 57: 256-266.

Rehage, J.S. and A. Sih. 2004. Dispersal behavior, boldness and the link to invasiveness: A comparison of four *Gambusia* species. *Biological Invasions* 6: 379-391.

Rehage, J.S., S.G. Lynn, J.I. Hammond, B.D. Palmer, and A. Sih. 2002. Effects of larval exposure to Triphenyltin on the survival, growth, and behavior of larval and juvenile *Ambystoma barbouri*. *Environmental Toxicology and Chemistry* 21: 807-815.

RECENT RESEARCH PRESENTATIONS

Rehage, J.S. and W.F. Loftus. Vulnerability to a novel invader: behavioral response of naïve prey to the invasion of the African jewelfish *Hemichromis letourneuxi*. Ecological Society of America Meeting, Memphis, TN, August 2006.

Rehage, J.S., S.E. Liston, and W.F. Loftus. Assessing the potential impact of African jewelfish *Hemichromis letourneuxi* in Everglades marshes. International Conference on Aquatic Invasive Species, Key Biscayne, FL, May 2006.

Rehage, J.S. and W.F. Loftus. Seasonal fish community dynamics along the marsh-mangrove ecotone in Everglades National Park. Mangroves as Fish Habitat Symposium, Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, Key Biscayne, FL, April 2006 and Greater Everglades Restoration Conference, Orlando, FL, June 2006.

Rehage, J.S. and J.C. Trexler. Assessing the net effect of anthropogenic disturbance on aquatic communities in wetlands: community structure relative to distance from canals. Ecological Society of America Meeting, Montreal, August 2005.

Rehage, J.S. and W.F. Loftus. Examining the role of marsh-mangrove ecotonal habitats as aquatic refuges for wetland fishes. U.S. Geological Survey All Florida Scientists Meeting, Orlando, FL, May 2005.

BIOGRAPHICAL SKETCH

NAME Riegl, Bernhard Michael	POSITION TITLE Associate Professor, Oceanographic Center Nova Southeastern University Assoc. Director, National Coral Reef Institute 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3671 reiglb@nova.edu
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Karl-Franzens-Universität Graz	Habilitation	2000-	Actuopalaeontology
University of Cape Town	PhD	1993	Zoology
University of Vienna	MSc	1989	Zoology

OTHER APPOINTMENTS:

Adjunct Professor, Institut für Geologie und Paläontologie, Karl-Franzens-Universität Graz, Austria

Adjunct Professor, Rosenstiel School of Marine and Atmospheric Science, University of Miami

ACADEMIC POSITIONS HELD:

2003: **Associate Professor** at the Oceanographic Center, Nova Southeastern University and **Associate Director** of the National Coral Reef Institute.

2001- 2003: **Adjunct professor** at the Oceanographic Center, Nova Southeastern University.

2000 - 2003: **Research Scientist** at the National Coral Reef Institute, Nova Southeastern University.

since 1999 : **Adjunct professor** at Karl-Franzens-University Graz.

1999: **Austrian Science Foundation Research Fellow** at the Institute of Geology and Paleontology, Karl-Franzens University Graz, Austria. **Adjunct faculty** at the Division of Marine Geology and Geophysics, RSMAS, University of Miami (since July 1998).

1998-1999: **Manager** and **Senior Scientist** of the Caribbean Marine Research Center (National Undersea Research Center, NOAA) at Lee Stocking Island, Bahamas.

1995-1997: **Adjunct Lecturer** at Institut für Paläontologie, Universität Wien, Austria.

1995: **Erwin Schrödinger Post-doctoral Research Fellow** (Austrian Science Foundation) at Institut für Paläontologie der Universität Wien, Austria, and Universidad de Granada, Spain.

1994: **Post Doctoral Research Associate** at the Institut für allgemeine Biologie and Institut für Paläontologie, Universität Wien, Austria.

ABBREVIATED RECENT FUNDING HISTORY:

2002: St. John's River Water Management District Development of acoustic mapping tools for drift algae, as PI

2003: NOAA Development of seascape maps for Broward and Dade County, as PI
2004: President's Faculty Development and Research grant: development of biomarkers for corals, as PI
2004: NOAA: Development of patterning statistics and maps in Broward County benthos, as PI
2004: NOAA: the NCRI Monitoring Network, as PI
2004: The Nature Conservancy: Seascape maps of SE Florida, as PI
2005: WWF Development of coral reef management capability in UAE and Qatar, as PI
2005: St. John's River Water Management District Development of acoustic mapping tools for drift algae, as PI

RECENT PEER REVIEWED PAPERS IN SCIENTIFIC JOURNALS

- Riegl, B. (2002) Effects of the 1996 and 1998 SST anomalies on corals, coral diseases and fish in the Arabian Gulf (Dubai, UAE). *Marine Biology* 140: 29-40
- Rasser, M. & Riegl, B. (2002) Holocene coral reef rubble and its binding agents. *Coral Reefs* 21(1): 57-72.
- Riegl B, Piller WE (2003) Possible refugia for reefs in times of environmental stress. *International Journal of Earth Science* 92(4):520-531
- Piller WE, Riegl B (2003) Vertical versus horizontal growth strategies of coral frameworks. *International Journal of Earth Science* 92(4):511-519
- Riegl B (2003) Global climate change and coral reefs: different effects in two high latitude areas (Arabian Gulf, South Africa). *Coral Reefs* 22(3): 433-446
- Manfrino C, Riegl B, Hall JL, Graifman R (2003) Status of coral reefs of Little Cayman, Grand Cayman and Cayman Brac, British West Indies, in 1999 and 2000 (Part 1: stony corals and algae). *Atoll Research Bulletin* 496: 204-225.
- Andréfouët S, Kramer P, Torres-Pulliza D, Joyce KE, Hochberg EJ, Garza-Pérez R, Mumby PJ, Riegl B, Yamano H, White WH, Zubia M, Brock JC, Phinn SR, Naseer A, Hatcher BG, Muller-Karger FE (2003) Multi-site evaluation of IKONOS data for classification of tropical coral reef environments. *Remote Sensing of Environment* 88: 128-143
- Andréfouët S, Riegl B (2004) Remote sensing: a key tool for interdisciplinary assessment of coral reef processes. *Coral Reefs* 23(1): 1-4
- Riegl B, Purkis SJ (2005) Detection of shallow subtidal corals from IKONOS satellite and QTC View (50, 200 kHz) single-beam sonar data (Arabian Gulf; Dubai, UAE). *Remote Sensing of Environment* 95: 96-114
- Riegl B, Moyer RP, Morris L, Virnstein R, Dodge RE (2005) Determination of the distribution of shallow-water sea grass and drift algae communities with acoustic seafloor discrimination. *Revista de Biología Tropical* 53 (Suppl. 1): 165-174.
- Renegar DA, Riegl B (2005) Effect of nutrient enrichment and elevated CO₂ partial pressure on growth rate of the Atlantic zooxanthellate coral *Acropora cervicornis*. *Marine Ecology Progress Series* 293: 69-75.

- Purkis SJ, Riegl B, Andréfouët S (2005) Remote sensing of geomorphology and facies patterns on a modern carbonate ramp (Arabian Gulf U.A.E.) *Journal of Sedimentary Research* 75: 861-876.
- Halfar J, Godinez-Orta L, Riegl B, Valdez-Holguin JE, Borges JM (2005) Living on the edge: high-latitude *Porites* carbonate production under temperate eutrophic conditions. *Coral Reefs* 24: 582-592.
- Riegl B, Moyer RP, Morris LJ, Virnstein R, Purkis SJ (2005) Distribution and seasonal biomass of drift macroalgae in the Indian River Lagoon (Florida, USA) estimated with acoustic seafloor classification (QTCView, *Echoplus*). *Journal of Experimental Marine Biology and Ecology* 326: 89-104.
- Halfar J, Strasser M, Riegl B, Godinez-Orta L (2006) Oceanography, sedimentology and acoustic mapping of a bryomol carbonate factory in the northern Gulf of California, Mexico. in: Pedley H.M, Carrannante, G., (Eds.) Cool-Water Carbonates: Depositional Systems and Palaeoenvironmental control. *Geological Society, London, Special Publications*, 255, 199-217.
- Hetzinger, J, Halfar, J., Riegl, B., Godinez-Orta, L. (2006) Sedimentology and acoustic mapping of modern rhodolith beds on a non-tropical carbonate shelf (Gulf of California, Mexico). *Journal of Sedimentary Research* 76: 670-682.
- Purkis SJ, Myint S, Riegl B (2006) Enhanced detection of the coral *Acropora cervicornis* using a contextual classifier. *Remote Sensing of Environment* 101: 82-94.
- Reviewed papers in recent conference proceedings and book chapters**
- Riegl B, Moyer RP, Andrefouet S (2002) Integration of satellite remote-sensing of subtidal habitats with vessel-based video survey (Dubai, UAE, Arabian Gulf). *Proceedings of the 7th International Conference on Remote-Sensing in Coastal and Marine Habitats, Miami* (on CD)
- Riegl B, Piller WE (2002) Upwelling areas as possible refugia in times of rising SST? Further evidence from the Caribbean and Indian Oceans. *Proceedings of the 9th International Coral Reef Symposium, Bali, Volume 1*: 315-320
- Rezai H, Wilson S, Clareboudt M, Riegl B (2004) Coral reef status in the ROPME sea area: Arabian/Persian Gulf, Gulf of Oman and Arabian Sea. In: Wilkinson C (ed) Status of Coral Reefs of the World: 2004. *Australian Institute of Marine Science, Townsville*: 155-170.
- Riegl B, Purkis SJ, Kohle K, Dodge RE (2006) Spatial patterns in Arabian Gulf coral assemblages (Jebel Ali, Dubai, U.A.E.) in response to temperature forcing. *Proceedings of the 10th International Coral Reef Symposium, Okinawa*: 683-687.

BIOGRAPHICAL SKETCH

NAME Shivji, Mahmood S..	POSITION TITLE Associate Professor, Oceanographic Center Director, Guy Harvey Research Institute Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3653 mahmood@nova.edu
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Washington, Seattle, WA	PhD	1990	Molecular Marine Biology
University of California, Santa Barbara, CA	MS	1984	Marine Biology
Simon Fraser University, British Columbia, Canada	BSc	1980	Biology

TEACHING EXPERIENCE (1993 – present)

Courses taught: Genetics (BIOL 3600), Lecture and Laboratory
 Cell and Molecular Biology (BIOL 4340)
 Biology for non-majors (LSC 105)
 Genes, Chromosomes, and Human Heredity (BIOL 1070)
 Basics of Human Heredity (BIOL 1070)
 Molecular Marine Biology (OCMB 7013) - Graduate course
 Biology of Sharks (OCMB 6225) – Graduate course

10 MOST RECENT PUBLICATIONS:

Richards, V.P., J.D. Thomas, M.J. Stanhope and **M.S. Shivji**. 2006. Genetic connectivity in the Florida reef system: comparative phylogeography of commensal invertebrates with contrasting reproductive strategies. **Molecular Ecology**. *In Press*.

Shivji, M.S., J. E. Magnussen, L. R. Beerkircher, G. Hinteregger, D. W. Lee, J. E. Serafy, and E. D. Prince. 2006. Validity, identification and distribution of the roundscale spearfish, *Tetrapturus georgii*: morphological and molecular evidence. **Bulletin of Marine Science**. *In Press*.

Hoelzel, R.A., **M. S. Shivji**, J. E. Magnussen and M.P. Francis. 2006. Low worldwide genetic diversity in the basking shark (*Cetorhinus maximus*). **Biology Letters**. *In Press*. Available early on line.

- Clarke, S.C., J.E. Magnussen, D.L. Abercrombie, M. McAllister and **M.S. Shivji**. 2006. Identification of shark species composition and proportion in the Hong Kong shark fin market based on molecular genetics and trade records. **Conservation Biology** 20: 201-211.
- Garla, R.C., D.D. Chapman, B. M. Wetherbee and **M.S. Shivji**. 2006. Movement patterns of Caribbean reef sharks, *Carcharhinus perezii*, at Fernando de Noronha Archipelago, Brazil: evaluating the effectiveness of marine protected areas for conservation of reef shark breeding grounds. **Marine Biology** 149:189-199.
- Shivji, M.S.**, D.D. Chapman, E.K. Pikitch and P.W. Raymond. 2005. Genetic profiling reveals illegal international trade in fins of the great white shark, *Carcharodon carcharias*. **Conservation Genetics** 6: 1035-1039.
- Abercrombie, D.L., S.C. Clarke and **M.S. Shivji**. 2005. Global-scale genetic identification of hammerhead sharks: Application to assessment of the international fin trade and law enforcement. **Conservation Genetics** 6: 775-788.
- Pikitch, E.K. D.D. Chapman, E.A. Babcock and **M.S. Shivji**. 2005. Diversity, demographic population structure and habitat-partitioning of reef-associated elasmobranchs at a Caribbean oceanic atoll (Glover's Reef, Belize). **Marine Ecology Progress Series** 302: 187-197.
- Chapman, D., E.K. Pikitch, E. Babcock and **M. Shivji**. 2005. Marine reserve design and evaluation using automated acoustic telemetry: a case-study involving coral reef-associated sharks in the Mesoamerican Caribbean. **Marine Technology Society Journal**. 39: 42-53.
- Chapman, D.D., P.A. Prodohl, J. Gelsleichter, C.A. Manire and **M.S. Shivji**. 2004. Predominance of genetic monogamy by females in a hammerhead shark, *Sphyrna tiburo*: Implications for shark conservation. **Molecular Ecology** 13: 1965-1974.

GRADUATE STUDENT SUPERVISION

22 total, 9 current.

CURRENT EXTRAMURAL FUNDING

Pew Charitable Trusts, Pew Institute for Ocean Science - \$199,824 (2004-2006)
 Hai Stiftung/Shark Foundation, Switzerland - \$10,600 (2006)
 NOAA - Florida Sea Grant Program - \$148,210 (2006-2008)
 NOAA- National Marine Fisheries Service - \$30,000 (2005-2006)

BIOGRAPHICAL SKETCH

NAME Soloviev, Alexander V.	POSITION TITLE Associate Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004 954.262.3659 soloviev@ocean.nova.edu
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Moscow Inst. Of Physics & Technology	Dipl. Eng.	1976	
Shirshow Institute of Oceanology	PhD	1979	Oceanography
Shirshow Inst. Of Oceanography	DSc	1992	Oceanography

Appointments

Associate Professor NSU Oceanographic Center 1996 - Present
 Adjunct Professor University of Miami, RSMAS 2004-Present
 Researcher/Visiting Scientist SOEST University of Hawaii 1993-1998
 Visiting Professor Institute of Meteorology University of Hamburg 1994-1995
 Senior/Leading Scientist P.P. Shirshov Institute of Oceanology 1991-1993
 Doctorate Former USSR Academy of Sciences 1988-1991
 Junior/Senior Scientist A.M. Oboukhov Institute of Atmospheric Physics 1979-1988

Publications

Five publications most closely related to the proposed project:

Soloviev, A.V., M. E. Luther, and R. H. Weisberg, 2003: Energetic Baroclinic Super-Tidal Oscillations on the Shelf off Southeast Florida. *Geophysical Res. Letters* 30, no. 9
<http://www.nova.edu/~soloviev/2002GL016603.pdf>

Soloviev, A.V., R.J. Walker, R.H. Weisberg, and M.E. Luther, 2003: Costal Observatory Investigates Energetic Current Oscillation on the Southeast Florida shelf. *EOS, Transactions, AGU* 84, No. 42, 11 October 2003, 441-450

Shay, L.K., Cook, T.M., Peters, H., Mariano, A.J., Weisberg, R., An, P.E., A. Soloviev, and M. Luther, 2002: Very high-frequency radar mapping of surface currents. *IEEE Journal of Oceanic Engineering*, vol. 27, No. 2, 155-169

Soloviev, A., R. Lukas, and H. Matsuura, 2002: Sharp Frontal Interfaces in the Near-Surface Layer of the Tropical Ocean, Special Issue of *Journal of Marine Systems* (Elsevier) on *Ocean Fronts* 37(1-3), 47-68

Shay, L. K., T. M. Cook, B. K. Haus, J. Martinez, H. Peters, J. VanLeer, A. J. Mariano, P. E. An, S. Smith, A. Soloviev, R. Weisberg, and M. Luther, 2000: VHF Radar detects submesoscale vortex along the Florida Coast, *EOS* 81, 209-213

Five other significant publications:

Katsaros, K.B., A.V. Soloviev, R.H. Weisberg, and M.E. Luther, 2005. Reduced Horizontal Sea Surface Temperature Gradients under Conditions of Clear Sky and Weak Winds, *Boundary-Layer Meteorology* (in press)

Katsaros, K.B. and A.V. Soloviev, 2004: Vanishing Sea Surface Temperature Gradients at Low Wind Speeds, *Boundary-Layer Meteorology* 112, 381-396(16)

Soloviev, A. and R. Lukas, 2003: Observation of Wave Enhanced Turbulence in the Near Surface Layer of the Ocean During TOGA COARE, Deep-Sea Research, Part I 50, 371-395

Soloviev, A. and B. Klinger, 2001: Open Ocean Convection. In: *Encyclopedia of Ocean Sciences*, Academic Press, UK, 2,015-2,022

Soloviev, A., R. Lukas, and P. Hacker, 2001: An approach to parameterization of the oceanic turbulent boundary layer in the western Pacific warm pool, *J. Geophys. Res.* 106, 4421-4435

Synergetic Activities

Lectures at the WHOI GFD Summer School (2002, 2003, 2004)

Developed curricular materials for a course *Introduction Physical Oceanography* for distance learning program

Developed curricular materials for a course *Concepts in Fluid Mechanics* for a new MS degree program at NSU

Advised on wave and tidal conditions for architectural projects on the port development at Grand Turk, T.C. and at Ketchikan, Anchorage

Member of the Technical Advisory Committee (TAC) for the US Coral Reef Task Force

Collaborators and Other Affiliations

Collaborators and Co-Editors

Roger Lukas, Department of Oceanography, University of Hawaii at Manoa

Robert Weisberg, College of Marine Sciences, University of South Florida

Mark Luther, College of Marine Sciences, University of South Florida

Mark Donelan, RSMAS, University of Miami

Vladimir Kamenkovich, Department of Marine Science, University of Southern Mississippi

Hiroshi Matsuura, FRONTIER, Japan

Peter Schluessel, EUMETSAT, Germany Kristina Katsaros, AOML/NOAA (retired)

Graduate and Post-Doctoral Advisors

N. V. Vershinsky (deceased), Professor, P.P. Shirshov Institute of Oceanology,

Moscow, Russia; G.I. Barenblatt, Professor in Residence at UC Berkeley (formerly

with P.P. Shirshov Institute of Oceanology); .M. Kamenkovich, Professor, University of Southern Mississippi (formerly with

P.P. Shirshov Institute of Oceanology)

Thesis Advisor and Post Graduate-Scholar Sponsor

Committee member for 2 Ph.D. students: J. A. Hanafin/RSMAS (now with Imperial College,

UK) and M. Chernys/FAU (now with OE FAU). Thesis Advisor for MS Degree student at the

NSU OC (M. Malivovski); Thesis Advisor for 4 MS degree students in the former Soviet Union.

BIOGRAPHICAL SKETCH

NAME Spieler, Richard E.	POSITION TITLE Professor and Director of Academic Programs, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Louisiana State University	PhD	1975	Marine Science
Arkansas State University	MS	1971	Biology
Arkansas State University	BS	1970	Zoology
University of Maryland	BA	1963	Comparative Literature

WORK EXPERIENCE:

2006-present Director Academic Programs, Oceanographic Center
 2000-present Associate Director Guy Harvey Research Institute
 1991-present. Professor, Nova Southeastern University, Oceanographic Center
 1975-1991. Curator of Fishes, Milwaukee Public Museum.
 1987-1989. Acting Head, Vertebrate Zoology, Milwaukee Public Museum.
 1963-1992. Military officer on active and reserve duty, retired as Lieutenant Colonel

RESEARCH INTEREST:

Ichthyology, with emphasis on:
 - fish distribution and assessment
 - coral reef assessment and restoration
 - artificial enhancement of fisheries.
 - elasmobranch biology

GRANTS and CONTRACTS

- 26 grants as PI and CO-PI, \$2,500,000+ total

SCIENTIFIC PUBLICATIONS

- 40+ abstracts, 20+ reports, 70+ peer reviewed book chapters or journal articles

GRADUATE STUDENTS (as major advisor)

- 8 M.S., 4 Ph.D. completed
 - 6 M.S., 3 Ph.D. in progress

RELEVANT PUBLICATIONS

- Sherman, R.L., D.S. Gilliam and R.E. Spieler. 2001. Site-dependant differences in artificial reef function: Implications for coral reef restoration. *Bull. Mar. Sci.* 69 (2):1053-1056.
- Spieler R., D. Gilliam, and R. Sherman. 2001. Artificial substrate and coral reef restoration: What do we need to know to know what we need. *Bull. Mar. Sci.* 69(2): 1013-1030.
- Sherman, R.L., Gilliam, D.S. and R.E. Spieler. 2001. Artificial reef design: void space, complexity and attractants. *ICES Journal of Marine Science.* 59(s): S196-S200.
- Sherman, R.L., D.S. Gilliam and R.E. Spieler. 2001. Effects of refuge size and complexity on recruitment and fish assemblage formation on small artificial reefs. *Proc. 52nd Annual Gulf Caribb. Fish. Instit.* 455-467.
- Walker, B., B. Henderson and R.E. Spieler. 2002. Fish assemblages associated with artificial reefs of concrete aggregates or quarry stone offshore Miami Beach, Florida USA. *Aquat. Living Resour.* 15: 95-105.
- Turgeon, D.D., and 35 Co-Authors including R.E. Spieler. 2002. The state of coral reef ecosystems of the United States and Pacific freely associated states. National Oceanic and Atmospheric Administration/National Ocean Service/National Centers for Coastal Ocean Science, Silver Spring, MD. 265 pp.
- Jordan, Lance K.B., David S. Gilliam, Robin L. Sherman, Paul T. Arena, Fleur M. Harttung, Rob Baron, And Richard E. Spieler. 2002 Spatial and temporal recruitment patterns of juvenile grunts (*Haemulon* spp.) in south Florida. *Proc. Annual Gulf Caribb. Fish. Instit.* 322-336.
- Arena, P.T., Jordan, L.K.B., Sherman, R.L., Harttung, F.M. and R.E. Spieler. 2002. Presence of Juvenile Blackfin Snapper, *Lutjanus buccanella*, and Snowy Grouper, *Epinephelus niveatus*, on Shallow-water Artificial Reefs. *Proceedings of the 55th Gulf and Caribbean Fisheries Institute* 55: 700-712
- Baron, Robert M., Lance K.B. Jordan and Richard E. Spieler. 2004. Characterization of the marine fish assemblage associated with the nearshore hardbottom of Broward County Florida, USA. *Estuar Coast Shelf Sci.* 60: 431-443.
- Ferro, Fleur M., Lance K.B. Jordan and Richard E. Spieler. 2005 Spatial variability of the coral reef fish assemblages offshore Broward County, Florida. NOAA Tech. Memo. NMFS-SEFSC-532.
- Jordan, Lance K.B., David S. Gilliam and Richard E. Spieler. 2005 Effects of module spacing on the formation and maintenance of fish assemblages on artificial reefs. *Journal of Experimental Marine Biology.* 326, 170-186.
- Sherman, R.L. and R.E. Spieler. Tires: unstable materials for artificial reef construction. *WIT Transactions on Ecology and the Environment* vol 88: Environmental Problems in Coastal Regions. 215-223.
- Arena, P.T., Jordan, L.K.B., and R.E. Spieler. Fish assemblages on sunken-vessels and natural reefs in southeast Florida, U.S.A. *Hydrobiologia* (in press)
- Jordan, L.K.B., and R.E. Spieler Implications of natural variation of fish assemblages to coral reef management. *Proc. 10th Int. Coral Reef Sym.* (in press)

BIOGRAPHICAL SKETCH

NAME T-Raissi, Ali	POSITION TITLE & ADDRESS Director, Hydrogen R&D Division Florida Solar Energy Center University of Central Florida 1679 Clearlake Rd. Cocoa, FL 32922-5703 ali@fsec.ucf.edu
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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
University of California At Berkeley, CA	Ph.D.	1982	Engineering
Lehigh University, Bethlehem, PA	M.S.	1978	Mechanical Engineering
University of Tehran, Iran	B.S.	1975	Mechanical Engineering

Professional Experience

Aug., 02- Present	Director, Hydrogen R&D Division, Florida Solar Energy Center (FSEC), University of Central Florida (UCF), Orlando.
Nov., 87-Aug., 02	Research Faculty, Florida Solar Energy Center, Cocoa.
Sept., 86-Nov., 87	Senior Researcher, Natural Resources Res. Institute, University of Minnesota, Duluth.
Sept., 85-Sept., 86	Assistant Professor of Mechanical Engineering, Univ. of Hawaii (UH), Honolulu.
Aug., 82-Sept., 85	Research Fellow, Hawaii Natural Energy Institute, UH, Honolulu.

Honors and Awards

- 2004 Innovative Technology Award, 15th World Hydrogen Energy Conf., Yokohama, Japan.
- Member, UCF Office of Research & Commercialization Millionaire's Club – 2003 & 2005.
- UCF Institutes & Centers Award for Excellence in Research (2002-03 & 1992-93).

Selected Recent Hydrogen Technology Related Publications (out of close to 200 publications)

- **T-Raissi, A.**, Muradov, N.Z., Huang, C., Adebisi, O. "Hydrogen from Solar via Light-Assisted High-Temperature Water Splitting Cycles," *J. Solar Energy Engineering*, **2006** (in press).
- Mohajeri, N., **T-Raissi, A.**, K.K. Ramasamy, "Thermal Conductivity of Pure Ammonia-Borane Complex and its Composites with Aluminum Powder," *to appear in Thermochimica Acta*.

- Mohajeri, N., Adebisi, O., Baik, J., Bokerman, G., **A. T-Raissi**, "An Ammonia-Borane Based Hydrogen Storage System for Portable Applications," Preprint submitted to **2006** Fall ACS meeting, San Francisco, CA.
- Muradov, N.Z., **A. T-Raissi**, "Solar Production of Hydrogen Using "Self-Assembled" Polyoxometalate Photocatalysts," *J. Solar Energy Engineering*, Vol. 128, No. 3, August **2006**.
- **T-Raissi, A.**, Huang, C., Muradov, N.Z., Olawale, A., Mohajeri, N. "Production of Hydrogen via Solar Powered Sulfur-Ammonia Thermochemical Water Splitting Cycle," *16th World Hydrogen Energy Conf.*, Lyon, France, **2006**.
- Huang, C., Olawale, A., Muradov, N.Z., **T-Raissi, A.** "UV Light Photolysis of Ammonium Sulfite Aqueous Solution for Hydrogen Production," *16th World Hydrogen Energy Conf.*, Lyon, **2006**.
- Mohajeri, N., Adebisi, O., A. T-Raissi, "Hydrolytic Cleavage of Ammonia Borane Complex for Hydrogen Production," *Proc. 16th WHEC*, Lyon, France, **2006**.
- Mohajeri, N., **T-Raissi, A.**, K.K. Ramasamy, "Thermal Conductivity of Pure Ammonia-borane Complex and its Composites with Aluminum Powder," *Prepr. Pap.-Am. Chem. Soc., Div. Fuel Chem.* **2006**, 51(1), 309.
- Mohajeri, N., **A. T-Raissi**, "Novel Thermoneutral Catalytic Method for Dehydrogenation of Ammonia-borane Complex," *Prepr. Pap.-Am. Chem. Soc., Div. Fuel Chem.* **2006**, 51(1), 308.
- Huang, C., **T-Raissi, A.** "Analysis of Sulfur-Iodine Thermochemical Cycle for Solar Hydrogen Production. Part I: Decomposition of Sulfuric Acid," *Solar Energy* (**2005**), 78(5), 632-46.
- **T-Raissi, A.**, Muradov, N.Z., Huang, C., Taylor, R.L., Davenport, R.W. "Hydrogen from Solar via Light-Assisted High-Temp. Water-Splitting Cycles," *Int. Solar Energy Conf.*, Orlando, FL, **2005**.
- Mohajeri, N., **A. T-Raissi**, "Regeneration of Ammonia-Borane Complex for Hydrogen Storage," *Proc. 2005 MRS Spring Meeting*, San Francisco, CA, March 28-April 1, **2005**.
- Muradov, N.Z., F. Smith, **A. T-Raissi**, "Catalytic Activity of Carbons for Methane Decomposition Reaction," *Catalysis Today*, 102–103 (**2005**) 225–233.
- Huang, C., **A. T-Raissi**, "A New Sulfur Ammonia Thermochemical Water Splitting Cycle," *Proc. of the 15th World Hydrogen Energy Conf.*, Yokohama, Japan, **2004**.
- **T-Raissi, A.**, Block, D.L. "Hydrogen: Automotive Fuel of the Future," *IEEE Power & Energy*, 40-5, Nov./Dec., **2004**.
- Mohajeri N. and **T-Raissi, A.** "Hydrogen Storage in Ammonia-Borane Complexes," *Proc. of the 15th World Hydrogen Energy Conf.*, Yokohama, Japan, **2004**.
- Baik, J., **A. T-Raissi**, "R&D Processes for Increasing Density of Cryogenic Propellants at FSEC," *Cryogenics*, **2004**.
- Linkous, C.A., Huang, C. Fowler, J. Scott, G., **T-Raissi, A.**, Muradov, N.Z. "Closed Cycle Photochemical Methods for Deriving Hydrogen from Hydrogen Sulfide," *Proc. of the 14th World Hydrogen Energy Conf.*, Montreal, Canada, **2002**.

Patents Issued & Pending (as of July, 1, 2006): U.S. Patents 7,074,369, 6,582,666, 6,551,561, 6,531,035, 6,342,128, 6,334,936, 6,315,870, 6,309,611, 5,935,538 & 5,842,110, 5,744,407 & 5,604,339, 5,296,110 & Canadian Patent # 2,268,469 & 2,451,786. *U.S. Utility Application Nos. 11/414,572, 11/414,900, and more.*

Synergistic Activities and Services

- *Member*, ACS, AIChE & ASME, IAHE.
- *Member*, University of Central Florida Research Council, 2000-2002.
- *Member*, *Int. Advisory Committee*, TiO₂ Photocat. Purification & Treatment of Water &

Air.

- *Member of the Editorial Board*, Int. Journal of Hydrogen Energy (ISSN 0360-3199), 2003- present.

- *Visiting Scholar*, Tokyo University of Agriculture & Technology in 1995.

- *Keynote Speaker*, H₂ Storage Workshop held at Argonne National Lab., for DOE's HFC&IT & DOE-BES and NSF, 2002.

- *Leads activities* of more than 20 scientists and engineers (including 12 PhDs) involved in H₂ production & storage R&D.

- *Graduate* of JFK School of Government, Harvard University - Leadership for 21st Century.

Collaboration and Other Affiliations

Mohammad Enayetullah, V.P. Advanced Technologies, Protonex Technology Corp., Southborough, MA.

James Stevens, Catalyst Program Manager, Chevron Technology Ventures, Houston, TX.

Prof. Mohamed Eddaoudi, Department of Chemistry, University of South Florida, Tampa, FL.

Dr. Janine Captain, Applied Technology, National Aeronautics & Space Administration, John F. Kennedy Space Center, FL.

Hideo Kameyama, Professor of Chemical engineering, Tokyo University of Agriculture & Technology, JAPAN.

Takuya Doi, Electrochemical Laboratory, Tsukuba, Ibaraki, JAPAN.

James E. Funk, Department of Chemical Engineering, University of Kentucky, KY.

Michael J. Antal, Jr. and W. S-L Mok, Hawaii Natural Energy Institute, Honolulu, HI.

Guiyoung Han, Department of Chemical Engineering, Sungkyunkwan University, Suwon, Korea.

Charles E. Painter, Michael Lateluere and Stephen Stiles, NSWC, Indian Head Division, MD.

Michael R. Kemme, U.S. Army Construction Engineering Research Laboratory, Champaign, IL.

Michael D. Hampton, Department of Chemistry, University of Central Florida, Orlando, FL.

Ronald G. Barile, Dept. of Chemical Engineering, Florida Institute of Technology, Melbourne, FL.

Sudipta Seal, Associate Professor of Mechanical, Materials and Aerospace Engineering, Univ. of Central Florida, Orlando.

Graduate and Post-Doctoral Advisees

Najib Samad, Eric D. Martin, Olawale Adebiyi, Florida Institute of Technology, Melbourne, FL for M.S.

Donald Muzzey, Siva Jaganathan, Anand Solanki, University of Central Florida, Orlando, FL for M.S.

Aru Banerjee, Cunping Huang, Florida Solar Energy Center, Post-Doctoral Fellows.

Takuya Doi, Hideo Kameyama, Guiyoung Han, Visiting Scientists.

BIOGRAPHICAL SKETCH

NAME Thomas, James Darwin	POSITION TITLE Professor, Oceanographic Center Nova Southeastern University 8000 North Ocean Drive Dania Beach, FL 33004
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Louisiana State University, Baton Rouge, LA	BS	1971	Zoology
Louisiana State University, Baton Rouge, LA	MS	1975	Marine Science
Florida Institute of Technology	PhD	1991	Biological Oceanography

Appointments:

1998-present: **Research Director**, National Coral Reef Institute.

1996-present: **Associate Professor**, Oceanographic Center, Nova University.

1992-1996: **Curator**, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution.

Publications:

(i): 5 publications most closely related to the proposed project:

2005: Thomas, J.D. and K.N. Klebba. Studies of commensal leucothoid amphipods: Two new sponge-inhabiting species from South Florida and the Western Caribbean. In prep.

1998: Thomas, J.D. Ecology and behavior of *Maxillipius commensalis*, a gorgonophile amphipod from Madang, Papua New Guinea (Crustacea: Amphipoda: Maxillipiidae). Bulletin of Marine Science, 58(1):314-326, figs. 1-5.

1997: Thomas, J.D. Systematics and Phylogeny of the commensal amphipod family Anamixidae (Crustacea: Amphipoda). Records of the Australian Museum, Volume 49:35-98, figures 1-27-187.

1995: Thomas, J.D. and M. Ortiz. *Leucothoe laurensi*, n. sp., a new species of Leucothoid amphipod from Cuban

Waters (Crustacea: Amphipoda: Leucothoidae). Proceedings of the Biological Society of Washington, 108(4):613-616, figs. 1-2.

1983: Thomas, J.D., and J.L. Barnard. The Platyischnopiidae of the Americas (Crustacea: Amphipoda). Smithsonian Contributions to Zoology, 375:1-33, figs. 1-12.

(ii) 5 other significant publications:

2005: Richards, V. P., J. D. Thomas, and M. S. Shivji. Reproductive dispersal strategy and genetic connectivity in

commensal, sponge-dwelling, coral reef invertebrates. ASLO Summer Meeting. Santiago de Compostela, Spain. 19-24 June 2005.

2004: Richards, V.P, J.D. Thomas, Stanhope, M.J., and M.S. Shivji. High Levels of Gene Flow in Commensal

Brooding Marine Amphipods: Mitochondrial DNA variation in Florida populations of the *Leucothoe*

spinicarpa species complex. International Coral Reef Symposium. Okinawa Islands, Japan. 29 July 2004.

1996: Thomas, J.D.. Using Marine Invertebrates to Establish Research and Conservation Priorities. In *Biodiversity*

II: Understanding and Protecting our Biological Resources. Chapter 24, 357:369. Eds. M.L. Reaka-

Cudla, D. Wilson, and E.O. Wilson. National Academy Press, 551 pages..

1995: Thomas, J.D. and L.D. McCann. Chapter 2. The Families Argissidae, Dexaminidae, Eusiridae, Gammaridae,

Leucothoidae, Melphidippidae, Oedicerotidae, Pardaliscidae, Phoxocephalidae, Podoceridae, Stegocephalidae, Stenothoidae, Stilipedidae, Synopiidae, and Urothoidae. 116 pp, 94 figs.

(galley). In: *A*

Taxonomic Atlas to the Fauna of the Santa Maria Basin. Eds. L. Watling and P. Scott, editors.

1983: Thomas, J.D., and J.L. Barnard. Transformation of the *Leucothoides* morph to the *Anamixis* morph

(Amphipoda). *Journal of Crustacean Biology*, 3(1): 154-157.

Synergistic activities:

1. Developed web-based field marine biology courses in Belize (1999-2005):

www.nova.edu/ocean/belize/belize.htm and Australia (1992-2004):

www.nova.edu/~thomasjd/ozreef

2. Maintains amphipod homepage: www.nova.edu/ocean/jthomas/apod.html

3. Advisor to Broward County on developing Marine Protected Areas (MPA's).

4. Application and development of video/microvideo for research and teaching: amphipod behavior, coral

spawning, habitat evaluation and characterization fish behavior.

5. Faculty resource advisor, South Broward High School, Magnet School in Marine Biology.

Collaborators & Other Affiliations:

(i) *Collaborators*: Mark Hay, Erik Sotka, Linda McCann.

(ii) *Graduate advisors*: Harold Loesch (MS), whereabouts unknown; Walt Nelson (Ph.D.) EPA.

(iii) *Thesis and dissertation advisor*: current, 3 MS, 1 Ph.D.; 16 total, no postdoctoral students sponsored.

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE & ADDRESS
Venezia, William A.	Site Director Naval Surface Warfare Center South Florida Testing Facility 8010 North Ocean Drive Dania Beach, FL 33004 954.926.4001 veneziaWA@nswccd.navy.mil

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR	FIELD OF STUDY
Clemson University	Ph.D.	1975	Engineering Mechanics
Clemson University	M.S.	1971	Engineering Mechanics
Florida Atlantic University	B.S.	1970	Ocean Engineering

NOTE: The Biographical Sketch may not exceed four pages. Items A and B (together) may not exceed two of the four-page limit. Follow the formats and instructions on the attached sample.

A Positions and Honors.

Positions and Employment

2006-Present Site Director, Naval Surface Warfare Center, South Florida Testing Facility
 1984-2005 Chief Engineer, Naval Surface Warfare Center, South Florida Testing Facility
 1981-1984 Principal Scientist, General Offshore Corporation
 1981-Present Adjunct Professor, Florida Atlantic University and Nova Southeastern University
 1980-1981 Visiting Associate Professor, Florida Atlantic University
 1975-1980 Senior Staff Engineer, John Hopkins University Applied Physics Laboratory

Honors and Awards

2004 Conferred Fellow, *Marine Technology Society*

B. Selected peer-reviewed publications.

“TONGS-An Evolution of a Heavy-Lift Search and Recovery Remotely Operated Vehicle”, February 2004, *Underwater Intervention*, New Orleans, W.Venezia with others

“A successful Navy and Academic Partnership Providing Sustained Ocean Observation capabilities in the Florida Straights”, *Marine Technology Society Journal*, Volume 37, Number 3, Fall 2003, p 81-91, W. A. Venezia with others.

“Ocean Acoustic Sensor Installation at SFOMC”, *IEEE J. Oceanic Engineering*, **27**(2), p.235-244 Nguyen, H.B., H.A. DeFerrari, N.J. Williams, and W.A. Venezia, 2002

“A Combination Air Deceleration and Mooring Module for A-Sized Buoys,” F. R. Driscoll, W. Venezia, D. Curic, and T. Pantelakis, 2002, *Proceedings of the MTS/IEEE Oceans 2002 conference*. [Published]

“Turbine under Gulf Stream (TUGS) overview of an energy sourcepotential” Venezia, W.A.; Clark, A.M. OCEANS 94. Oceans Engineering for Today and Tomorrow and Preservation. Proceedings Volume 3, Issue , 13-16 Sep 1994
Page(s):III/443 - III/448 vol.3 Digital Object Identifier 10.1109/OCEANS.1994.364239

Summary: The authors present the details of a turbine under the Gulf Stream (TUGS) proposal submitted to the Advance Research Projects Agency (ARPA) under the Technology Reinvestment Project (TRP).

C. **Research Support.**

PATENTS : [Granted 2004] provisional patent #. 60\445,309, patent pending entitled
“Deployable and Autonomous Mooring System,” (#10/772,479)

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
vonEllenrieder, Karl	Assistant Professor Department of Ocean Engineering Florida Atlantic University 101 North Beach Road Dania Beach, Florida 33004-3023 954.924.7232 ellenrik@seatech.fau.edu

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Massachusetts Institute of Technology	B.S.	1990	Aeronautics & Astronautics
Stanford University	M.S.	1992	Aeronautics & Astronautics
Stanford University	Ph.D.	1998	Aeronautics & Astronautics
Monash University (Melbourne, Australia)	PostDoc	1998-2002	Mechanical Engineering

A. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

Positions and Employment

2003 – present Assistant Professor, Department of Ocean Engineering, Florida Atlantic University, SeaTech, Dania Beach, FL, 33004, USA
 2005 – present Consultant, Galus Marine LLC., Boyton Beach, FL, 33426, USA
 1997 – 1998 Consultant, Applied Thermal Technologies, Santa Clara, CA 95051, USA

Honors and Awards

Dean’s Faculty Award, 2005, College of Engineering, Florida Atlantic University
 Summer Faculty Fellow, 2004, NASA/ASEE, NASA Ames Research Center

B. Selected peer-reviewed publications.

1. von Ellenrieder, K. D. and Ackermann, L. E. J. (2006) Force/flow measurements on a low-speed, vector-thruster propelled UUV. *Oceans 2006 MTS/IEEE Conference*, Boston.

2. Parker, K. von Ellenrieder, K. D. and Soria, J. (2005) Using Stereo Multigrid DPIV (SMDPIV) measurements to investigate the vortical skeleton behind a finite-span flapping wing. *Expts. Fluids* vol **39**, n 2, pp. 281-298.
3. von Ellenrieder, K. D. Parker, K. and Soria, J. (2003) Flow structures behind a heaving and pitching finite-span wing. *J. of Fluid Mech.* **490**:129-138.
4. Parker, K. von Ellenrieder, K. D. and Soria, J. (2003) Flow visualization of the effect of pitch amplitude changes on the vortical signatures behind a three dimensional flapping airfoil. *Proc. SPIE* **5058**:331-343.
5. Buzard, A. J. Bull, H. H. and von Ellenrieder, K. D. (2005) Visualization and analysis of the flow behind a modified Schmidt wave propeller. *AIAA Paper 2005-0470*.
6. von Ellenrieder, K. D. Parker, K. and Soria, J. (2002) Visualization of the three dimensional flow behind oscillating foils. *AIAA Paper 2002-0696*.
7. von Ellenrieder, K. D. Kostas, J. and Soria, J. (2001) Measurements of a wall-bounded, turbulent, separated flow using HPIV *J. Turbulence* **2**:004.
8. von Ellenrieder, K. D. and Cantwell, B. J. (2000) Self-similar, slightly compressible, free vortices *J. Fluid Mech.* **423**:293-315.
9. von Ellenrieder, K.D. and Soria, J. (2003) Examination of the particle depth of field in digital holography. International Workshop on Holographic Metrology in Fluid Mechanics, Loughborough, UK.
10. von Ellenrieder, K. D. Soria, J. Lim, T.T. and Chew, Y. T. (2003) Image processing and feature extraction techniques for PIV measurements of Taylor-Couette flow. 7th Asian Symposium on Visualization, Singapore.
11. von Ellenrieder, K. D. Lim, T.T. and Soria, J. (2002) PIV measurements of second Taylor vortex flow. 3rd Australian Conference on Laser Diagnostics in Fluid Mechanics and Combustion, Brisbane, Australia.

C. Research Support. List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.

1. Hydrodynamic design of an unmanned underwater vehicle for port security applications (Center for Coastline Security Technology). ONR-supported work on the hydrodynamic design and testing of the propulsion system and control surfaces of an underwater vehicle. Period covered – 2005-2007.
2. NSF/DoD sponsored Research Experience for Undergraduates in Ocean Engineering Site. Organize and conduct summer research training for undergraduates in the field of Ocean Engineering. Period covered – 2004-2007.
3. NASA Summer Faculty Fellowship 2004. Collaborative work with the Fluid Mechanics Laboratory at NASA Ames Research Center – performed experiments on the flow past an oscillating wing.
4. A Sea Base Game Changing Enabler – A Rapidly Deployable Stable Platform.

6. Letters of Support

ORGANIZATION	LOCATION
University of Central Florida	Orlando, FL
Harbor Branch Oceanographic Center	Fort Pierce, FL
Nova Southeastern University Oceanographic Center	Dania, FL
Florida Power & Light Company	Juno Beach, FL
Aquantis, LLC	Carpinteria, CA
Ocean Renewable Power Company	North Miami, FL
U.S. Department of Energy	Washington, DC
National Renewable Energy Laboratory	Golden, CO
Ocean Power Technologies, Inc.	Pennington, NJ
Lockheed-Martin MS-2 Undersea Systems	Riviera Beach, FL
Oceaneering Advanced Technologies Group	Hanover, MD
Marine Industries Association of South Florida	Fort Lauderdale, FL



Office of Research & Commercialization

September 13, 2006

Mr. Frank Brogan, President
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431
brogan@fau.edu

Dear President Brogan,

The University of Central Florida/Florida Solar Energy Center (UCF/FSEC) is pleased to support the grant application being submitted by Florida Atlantic University for the development and implementation of a Center of Excellence in Ocean Energy Technology at FAU. UCF/FSEC will be happy to partner with FAU for the proposed center and will be able to provide the necessary research and development for hydrogen generation using clean ocean energy. UCF/FSEC has significant experience and expertise in hydrogen production and storage, detection and sensing, utilization and fuel cell R&D. In recognition of its achievements, FSEC has been designated a Center of Excellence in Hydrogen Research and Education by the United States Department of Energy since 1997. FSEC has led the Hydrogen Research at Florida Universities program funded by the NASA-Glenn Research Center since 2002. This multi-year, \$30 million RD&D and technology transfer and education activity includes seven state universities: FIU, FSU, FAMU, USF, UCF, UF and UWF. The Florida Solar Energy Center has managed the program activities of all member universities except those at the University of Florida. Furthermore, FSEC is leading DOE's \$19 million PEM fuel cell technology development coordinating the national activities of seven universities and three industry partners.

We recognize the importance of obtaining this funding to enhance FAU's infrastructure in establishing the Center of Excellence in Ocean Energy Technology in Dania Beach, Florida. We believe that hydrogen is a clean fuel provided that a renewable energy source is used for its production. Renewable ocean energy can be just such a resource. We therefore commend the efforts of the proposed Center to harness ocean energy and look forward to working in partnership with FAU.

Sincerely,

A handwritten signature in black ink, appearing to read "Jane Halpin".

Jane Halpin
Proposal Manager

HARBOR BRANCH
Oceanographic Institution, Inc.

5600 U.S. 1 NORTH
FORT PIERCE, FLORIDA 34946

(772) 465-2400
Fax (772) 465-7156
www.hboi.edu

September 11, 2006

President Frank Brogan
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431

Dear President Brogan:

Harbor Branch Oceanographic Institution, Inc. (HBOI) supports the grant application being submitted by Florida Atlantic University for the development and implementation of a Center of Excellence in Ocean Energy Technology at FAU and will be glad to partner with FAU in any aspect of the work planned for the proposed center. In particular, we will be able to provide our significant engineering services and our ship, the R/V SEWARD JOHNSON, for fabrication and offshore installation of prototype systems envisaged as part of the activities of the proposed Center. HBOI has a wealth of at-sea experience and its R/V SEWARD JOHNSON has the necessary capacity for offshore installation of significant at-sea systems. HBOI has worked with FAU on engineering related projects previously and is collaborating on a project involving autonomous underwater vehicles in mapping out harmful algal bloom off the coast of Florida.

We recognize the importance of obtaining this funding to enhance FAU's infrastructure in establishing the Center of Excellence in Ocean Energy Technology in Dania Beach, Florida. We believe that the Center will have a positive economic impact on the State of Florida and look forward to working with the proposed Center for harnessing ocean energy and to providing assistance to the Center as new opportunities arise.

Sincerely,



Patrick Boles
Chief Operating Officer

cc: Peter Tatro, Director
HBOI Center for Ocean Exploration

A NON PROFIT ORGANIZATION

Exempt from federal income tax under Internal Revenue Code Section 501(c)(3),
qualifying for tax-deductible contributions under Internal Revenue Code Section 170(c).



September 8, 2006

President Frank Brogan
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431

Dear President Brogan,

Nova Southeastern University (NSU) supports the grant application being submitted by Florida Atlantic University for the development and implementation of a Center of Excellence in Ocean Energy Technology at FAU. We will be glad to and interested in partnering with FAU in any and many aspects of the work planned for the proposed center. In particular, we will be able to provide the necessary environmental assessments of the waters and sea bottom off the coast of Florida. This would be for the purpose of for identifying potential locations for placement of the prototype systems that are envisaged as part of the activities of the proposed Center and for assessing the potential impact of the planned systems on the marine environment.

NSU has significant experience and expertise in assessing impacts of human activities in the coastal oceans around Florida on plankton, fish, and all forms of benthic and non-benthic marine life. NSU has worked in partnership with FAU previously and currently. We are partners with FAU and UF as part of the consortium with USGS. In addition NSU is a long-standing partner in SFOMC (South Florida Ocean Measurement Center) forming the North Campus where FAU SeaTech forms the South Campus. We are partners with FAU in the Florida COOS (Coastal Ocean Observing Systems) Caucus and the soon to be formed Florida COOS Research Consortium at FIO to collaborate on developing a state-wide coastal ocean observation system.

We recognize the importance of obtaining this funding to enhance infrastructure and research in establishing the Center of Excellence in Ocean Energy Technology in Dania Beach, Florida. We believe that the Center will have a positive economic impact on the State of Florida and look forward to working with the proposed Center for harnessing ocean energy and to providing assistance to the Center as new opportunities arise.

Sincerely,

A handwritten signature in blue ink, appearing to read "Richard Dodge".

Richard Dodge, PhD
Dean

8000 North Ocean Drive • Dania Beach, Florida 33004-3078 • (954) 262-3600
Fax (954) 262-4098



Florida Power & Light Company, 700 Universe Boulevard, Juno Beach, FL 33408

September 11, 2006

President Frank Brogan
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431

Dear President Brogan:

Florida Power and Light is supportive of FAU's proposal for a grant from the State of Florida to implement a Center of Excellence in Ocean Energy Technology at FAU. While the bulk of our power generation is based on traditional sources, we believe that alternative renewable forms of energy, if developed in a cost-effective manner, can play a significant role in meeting our energy needs in Florida. We believe that ocean energy has a great untapped potential in this regard, particularly for a state that is surrounded by the ocean. FAU's ocean engineering expertise, together with the existing infrastructure at the state-supported SeaTech Institute for Ocean and Systems Engineering makes the university well suited as a home for such a center.

The location of FAU's SeaTech campus, with its vicinity to deep waters and the Florida Current, is ideally located for research, development and testing of various candidate technologies for harnessing all forms of ocean energy. FPL recognizes the importance of obtaining this funding to enhance FAU's infrastructure and its ability to develop and commercialize novel technologies for harnessing ocean energy.

We believe the proposed Center is a worthwhile effort for the development of this important renewable source of energy. FPL will be glad to provide any guidance that the Center may need in its research and development efforts and in commercializing its technologies.

Sincerely,

A handwritten signature in blue ink, appearing to read "G. Keith Hardy, Jr.", is written over a faint, larger version of the signature.

G. Keith Hardy, Jr.
Vice President, Technical Services

GKH/jml

Copy to:
John Kitchens
Tony Rodriquez

an FPL Group company



September 11, 2006

The Honorable Frank T. Brogan
President
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431

Dear President Brogan,

Aquantis LLC is the creation of Dehlsen Associates LLC, a technology development company whose principals pioneered and have led the growth of the wind power industry worldwide. Our initial efforts led to the successful establishment of Zond Corp., in 1980, now the wind technology of G.E.; our current efforts have resulted in the establishment of Clipper Windpower plc, listed on the London Stock Exchange (AIM).

Today, Aquantis LLC is actively pursuing the advancement of wind-related technologies for harnessing energy from ocean currents. Assisted by a strong working relationship with FAU's Department of Ocean Engineering, forged over the past five years, the Aquantis C-Plane Ocean Current Turbine has progressed from an initial concept to a commercially viable technology, ready for deployment and operational demonstration. It appears that this technology, when fully developed, possesses clear potential as a sustainable resource to reliably supply a significant portion of Florida's future electricity needs.

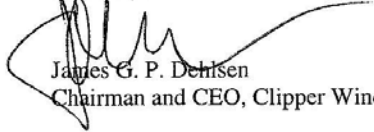
I am writing to express my full support for your proposal to the State of Florida seeking a grant to establish a Center of Excellence in Ocean Energy Technology at FAU. The ocean engineering expertise resident within FAU has been instrumental in the successful development of the C-Plane to date. With the existing infrastructure and unique location of the SEATECH Institute of Ocean Systems Engineering, I believe that FAU is extremely well-positioned to lead the technology development that is required to realize sustainable ocean-based energy production. The proximity to deep water and the axis of the Gulf Stream, make the proposed Center of Excellence an ideal site for research, development and testing of the various candidate technologies for harnessing ocean energy.

6305 CARPINTERIA AVE., SUITE 300 • CARPINTERIA, CALIFORNIA 93013
TEL 805-690-3272 • FAX 805-899-1115

The Aquantis Team believes that the proposed Center can provide the base expertise and infrastructure necessary to develop a range of viable ocean energy technologies. We are fully committed to continuing our work with FAU and the Center, recognizing that this will help our C-Plane system to successfully transition to a commercial status. In addition, we will be pleased to provide any industry guidance that the Center may require for its research and development efforts, and are prepared to assist in mapping out a clear path to successful transitioning your innovative technologies to industry. The individuals who comprise Aquantis have significant experience in all aspects of the required technology development enterprise, including commercialization and financing, as we recently demonstrated with the success of Clipper Windpower.

I believe that FAU as a Center of Excellence for Ocean Energy Technology represents an excellent opportunity for the State of Florida to benefit in furthering its reach in education, energy security, mitigation of carbon emissions, and intelligent use of indigenous energy resources. I look forward to a continuing and growing partnership with FAU in such endeavors.

Sincerely,



James G. P. Dehisen
Chairman and CEO, Clipper Windpower

Cc: Mr. Rick Driscoll

JD/hg



oceanrenewable power company

2430 NE 199th Street
N. Miami, FL 33180

Christopher R. Sauer, P.E.
President & CEO

Phone: (813) 417-6660
csauer@OceanRenewablePower.com

September 7, 2006

Mr. Frank Brogan
President
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431

Dear President Brogan,

Ocean Renewable Power Company, LLC (ORPC) is a Florida-based company that is pursuing development of proprietary new technology for harnessing energy from ocean currents. We are currently working with SeaTech, FAU to implement a prototype Ocean Current Generation (OCGen™) module project in the Florida Current (Gulf Stream) near Dania Beach.

We believe that ocean energy has a great potential for meeting a significant portion of the future energy needs of Florida. We also believe, and have been told privately by Florida Power and Light Company, that the Florida Current is the only renewable energy resource in Florida that has the potential for large scale development. I am therefore writing in support of your proposal for a grant from the State of Florida to implement a Center of Excellence in Ocean Energy Technology at FAU. FAU's renowned ocean engineering expertise, together with the existing infrastructure at the state-supported SeaTech Institute for Ocean and Systems Engineering, makes FAU ideally suited as a home for such a center. Moreover, SeaTech, with its proximity to deep waters and the Florida Current, is ideally located for research, development and testing of various candidate technologies for harnessing all forms of ocean energy. ORPC recognizes the importance of obtaining this funding to enhance FAU's infrastructure and its ability to develop and commercialize novel technologies for harnessing ocean energy. If FAU obtains this funding, it will be positioned to play a critical role in helping private industry develop the technologies that will lead to commercially viable projects that take advantage of Florida's unique ocean resource.

We believe the proposed Center will provide a firm base for the development of these important renewable energy technologies and systems. We are committed to working with FAU and envisage that we will make significant strides in the development of our

Mr. Frank Brogan
September 7, 2006
Page 2 of 2



OCCGen™ system from a prototype to a physical full-scale system if FAU develops the proposed infrastructure as part of the Center. We will be glad to provide any industry guidance that the Center may require in its research and development efforts and in mapping out a clear path for transitioning innovative technologies to industry. We have significant experience in marketing and in seeking investors in support of ocean energy.

With the recent escalation in energy prices and the degradation to our environment being caused by burning fossil fuels, this is a great opportunity for FAU and for our State to step forward and take a leadership position in ocean energy. We look forward to working with you in a continued partnership in this endeavor.

Sincerely,

A handwritten signature in blue ink, appearing to be "Frank Brogan", written over a horizontal line.



Department of Energy
Washington, DC 20585

September 12, 2006

President Frank Brogan
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431

Dear President Brogan:

President Bush's Advanced Energy Initiative places great emphasis on increasing the amount of renewable energy in the nation's energy supply; the Energy Policy Act of 2005 authorizes the Department of Energy to establish an ocean energy research and development program; and a number of companies are in the process of setting up ocean energy demonstration projects in U.S. waters. Clearly, the interest in using the ocean as a source of renewable energy is on the increase. However, successfully developing optimized, cost-effective systems for harnessing ocean energy will require an investment in ocean energy technology development and testing.

The U.S. Department of Energy Wind and Hydropower Technologies Program supports Florida Atlantic University's (FAU) proposal to establish an Ocean Energy Technology Center of Excellence. State-based centers such as this will be critical to forming partnerships and coordinating resources in the effort to advance potential for ocean energy in Florida as well as the Nation.

We believe the proposed Ocean Energy Technology Center would be an important step by Florida toward understanding and developing ocean energy technologies and harnessing ocean energy as a significant state-based renewable energy supply.

Sincerely,

A handwritten signature in black ink, appearing to read "James M. Ahlgrim".

James M. Ahlgrim
Team Leader
Office of Wind and Hydropower Technologies
Energy Efficiency and Renewable Energy



Printed with soy ink on recycled paper

September 12, 2006

President Frank Brogan,
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431
brogan@fau.edu

Dear President Brogan:

Ocean energy, in the form of waves, currents, tides and thermal gradients, has a great untapped potential in meeting significant portion of our energy needs. National Renewable Energy Laboratory has therefore requested funding in the federal budget for exploring ocean energy and is supportive of FAU's proposal for a grant from the State of Florida to establish a Center of Excellence in Ocean Energy Technology at FAU. The resident ocean engineering expertise and on-going research effort in this area, together with the existing infrastructure at its SeaTech facility on Florida's east coast makes FAU well suited as a home for such a center. The location, with its vicinity to deep waters and the Florida current is ideally located for research, development and testing of technologies, in conjunction with industry, for harnessing all forms of ocean energy. NREL recognizes the need for the state funding to enhance FAU's infrastructure and its ability to develop and commercialize novel technologies for harnessing ocean energy.

We believe the proposed Center, representing a focused effort in harnessing ocean energy, is one way of ensuring that research and development effort is followed properly. NREL will provide advice and any guidance that the Center may need in its research and development efforts.

Sincerely,



Robert W. Thresher
Center Director, National Wind Technology Center
National Renewable Energy Laboratory



O.P.T.

Ocean Power Technologies, Inc.
609-730-0400, Fax: 609-730-0404
e-mail: gtaylor@oceanpowertech.com

1590 Reed Road

Pennington, NJ 08534 USA

September 13, 2006

President Frank Brogan,
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431

Dear President Brogan,

Ocean Power Technology (OPT) is a New Jersey-based company that has successfully developed wave energy conversion (WEC) systems for harnessing ocean wave energy and for transferring the power to a grid network.

We are currently seeking to work actively with SeaTech, FAU on merging our small PowerBuoy™ WEC system to a docking system for autonomous underwater vehicles that has been developed at FAU.

Our work in this area has convinced us that ocean energy has a great potential as a renewable source for meeting the energy needs of our nation. As advances are made in electronics and computer systems, significantly optimized technologies with improved efficiencies can be developed through research and development efforts.

I am therefore writing in support of your proposal for a grant from the State of Florida to implement a Center of Excellence in Ocean Energy Technology at FAU. FAU's ocean engineering expertise, together with the existing infrastructure at your SeaTech Institute for Ocean and Systems Engineering is well suited for such a center. Moreover, SeaTech, with its vicinity to deep waters and the Gulf Stream is ideally located for research, development and testing of various candidate technologies for harnessing various forms of ocean energy. OPT recognizes the importance of obtaining this funding to enhance FAU's infrastructure and its ability to develop and commercialize novel technologies for harnessing ocean energy.

The proposed Center will have a significant impact on the development of this renewable energy. We committed to working with FAU and envisage that the Center will give a significant boost to our collaborative activities. We will be glad to provide any guidance that the Center may require in its research and development efforts and in transitioning innovative technologies to industry. We look forward to our continued partnership in this endeavor.

Sincerely,



Dr. George W. Taylor
CEO

Lockheed Martin
MS2-Undersea Systems
Mission & Unmanned Systems
100 East 17th Street
Riviera Beach, FL 33404-5664
(561) 842-5261 • Fax (561) 842-5303



September 11, 2006

President Frank Brogan,
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431
Email: brogan@fau.edu

Dear President Brogan,

Lockheed Martin wishes to express its support for Florida Atlantic University's proposal for a grant from the State of Florida to implement a Center of Excellence in Ocean Energy Technology at FAU. We believe that renewable ocean energy, if realized, can play a significant role in meeting our energy needs in Florida. In view of its ocean engineering expertise and on-going research in this area, together with the existing infrastructure at SeaTech, FAU is well placed to serve as a host for the proposed Center. Additionally, FAU's SeaTech campus, with its vicinity to deep waters and the Gulf Stream, is ideally located for research, development and testing of various systems for harnessing the different forms of ocean energy. We recognize the importance of obtaining this state funding to enhance FAU's infrastructure and its ability to develop and commercialize novel technologies for harnessing ocean energy.

Lockheed Martin has a long standing relationship with FAU and its department of Ocean Engineering. A significant number of our engineers in South Florida are FAU graduates. An air-deployable buoy developed at FAU has been licensed to a sister company within Lockheed Martin to facilitate transition of the technology to industry and the Navy. I serve on the advisory boards of the College of Engineering and Computer science and Department of Ocean Engineering.

We commend you on offering your expertise for the development of this important renewable energy source. Lockheed Martin will be glad to provide guidance to the Center for its R&D efforts, and in commercializing its technologies.

Sincerely,

A handwritten signature in cursive script that reads "Paul Rushfeldt".

Paul Rushfeldt, Sc.D., P.E.



11 September 2006

President Frank Brogan,
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431

Ref: Center of Excellence in Ocean Energy Technology (COEOET)

Subject: Development of Ocean Energy Technology

Dear President Brogan,

Oceaneering International Inc. (OII) supports the grant application being submitted by Florida Atlantic University for the development and implementation of a Center of Excellence in Ocean Energy Technology at FAU. OII would look forward to partnering, with FAU in any aspect of the work planned for the proposed center. OII is an advanced applied technology company that provides engineered services and hardware to clients who operate in marine, space, and similar harsh environments. OII is a world leader in applied ocean engineering and our mature products include remotely operated vehicles, mobile offshore production systems, built-to-order specialty hardware, engineering and project management, subsea intervention and installation services, non-destructive testing and inspections, and manned diving. As you may know, we are currently working with FAU on the design of a Rapidly Deployable Stable Platform for ONR. OII is providing technical expertise, ocean engineering, and fabrication for this program and would envision a similar relationship with the Center of Excellence Program.

OII recognizes the importance of obtaining the funding to enhance FAU's infrastructure in establishing the Center of Excellence in Ocean Energy Technology in Dania Beach, Florida. We believe that this Center will have a positive economic impact on the State of Florida, the nation, and likely the world. OII again looks forward to working with the proposed Center of Excellence for harnessing ocean energy and to providing continuing assistance to this Center as new opportunities develop.

Please free to contact me at 443-459-3700 with any questions or if you need more information.

Sincerely,
Oceaneering International, Inc

A handwritten signature in black ink, appearing to read "L. Karl", is positioned above the typed name.

Larry Karl
Marine Systems Manager

2312 SO. ANDREWS AVENUE · FORT LAUDERDALE FL 33316 ·
(954) 524-2733 · FAX (954) 524-0633
www.miasf.org e-mail: miasf@miasf.org



September 12, 2006

President Frank Brogan,
Florida Atlantic University
777 Glades Road,
Boca Raton, FL 33431

Dear President Brogan:

The Marine Industries Association of South Florida (MIASF) wishes to express its support for the grant application being submitted by Florida Atlantic University for the development and implementation of a Center of Excellence in Ocean Energy Technology at FAU.

The MIASF is known throughout South Florida as a valued marine trade organization that serves eight hundred marine based businesses in South Florida. The MIASF provides its members opportunities for networking, community involvement, exposure, advocacy and value.

FAU's Department of Ocean Engineering is a valued member of our organization and we recognize the importance of obtaining this funding to enhance its infrastructure and its ability to develop and commercialize novel technologies for harnessing ocean energy.

Because the MIASF works closely with the local marine community, which supports our long-term growth and viability, we are confident that the establishment of a Center for Excellence in Ocean Energy Technology in Dania Beach, Florida will have a positive economic impact on the State of Florida.

We look forward to the promising new technologies that are sure to result from this proposed endeavor and continuing to provide assistance to this new center as opportunities arise.

Sincerely,

Frank Herhold

FFH/rlc

7. Cost Proposal and Budget

Budget

	FY07	FY08	FY09	Total
Infrastructure:				
<i>Core Facility for use by Industry and Academia</i>				
Equipment	40,000	40,000	30,000	110,000
Technical Personnel	20,000	60,000	20,000	100,000
Supplies	10,000	10,000	5,000	25,000
Task Subtotal				235,000
<i>Testing Range</i>				
Equipment	474,500	538,000		1,012,500
Technical Personnel	75,000	225,000	50,000	350,000
Supplies	10,000	30,000	40,000	80,000
Ship Time	50,000	175,000	25,000	250,000
Task Subtotal				1,692,500
<i>Ocean Energy Driven Cold Water Cooling System</i>				
Equipment		350,000	91,500	441,500
Technical Personnel	20,000	80,000	25,000	125,000
Supplies		13,000	10,000	23,000
Ship Time		50,000	50,000	100,000
Task Subtotal				689,500
Research and Training:				
<i>Ocean Energy Systems (including harvesting, cold water, hydrogen, and fresh water technologies)</i>				
Faculty	190,000	370,000	180,000	740,000
Postdoctoral Fellows	162,500	325,000	162,500	650,000
Ph.D. Graduate Students	60,000	123,600	63,654	247,254
Masters Graduate Students	30,000	61,800	30,900	122,700
Tuition	86,812	138,899	52,087	277,798
Supplies	45,000	70,000	40,000	155,000
Travel	10,000	15,000	10,000	35,000
Ship Time	25,000	60,000	15,000	100,000
Task Subtotal				2,327,752
<i>Environmental Assessment and Characterization</i>				
Faculty Mentor	80,000	160,000	80,000	320,000
Postdoctoral Fellows	65,000	130,000	65,000	260,000
Ph .D. Graduate Students	30,000	61,800	31,827	123,627
Tuition	26,044	41,670	15,626	83,339

Supplies	15,000	23,000	15,000	53,000
Tavel	4,000	6,000	4,000	14,000
Ship Time	55,000	60,000		<u>115,000</u>
Task Subtotal				968,966
<i>Materials and Composites</i>				
Faculty	40,000	70,000	39,115	149,115
Postdoctoral Fellows	32,500	65,000	32,500	130,000
Ph .D. Graduate Students	20,000	41,200	21,218	82,418
Tuition	17,362	27,780	10,417	55,560
Supplies	15,000	23,000	15,000	53,000
Travel	3,000	5,000	3,000	<u>11,000</u>
Task Subtotal				481,093
Competitive Grant Funding				
<i>2-5 Grants to Fund Technology Development</i>	1,500,000	1,500,000		<u>3,000,000</u>
Task Subtotal				3,000,000
Outreach				
<i>Seminar Program and Symposia:</i>	10,000	10,000	10,000	<u>30,000</u>
Task Subtotal				30,000
<i>Industry Training</i>				
Personnel	35,000	35,000	20,000	90,000
Supplies	2,000	5,000	2,000	<u>9,000</u>
Task Subtotal				99,000
Overhead				
<i>Technology Transfer</i>				
Personnel	15,000	30,000	25,000	70,000
Professional Services	5,000	60,000	65,000	130,000
Travel	2,000	3,000	2,000	<u>7,000</u>
Task Subtotal				207,000
<i>Administration:</i>				
Personnel	50,000	130,000	62,190	242,190
Supplies	2,000	3,000	2,000	7,000
Travel	5,000	10,000	5,000	<u>20,000</u>
Task Subtotal				269,190
TOTAL				\$10,000,000

Budget Justification

Infrastructure

An Ocean Engineering Facility has been established at FAU's SeaTech Campus with previously allocated state funding. The Naval Surface Warfare Center Caderock Division has established the South Florida Testing Facility which includes a large offshore instrumented testing range. As part of this proposal, the facilities at SeaTech and the offshore testing range will be augmented with equipment and instruments needed to establish a core capability in Ocean Energy Technology Development. In addition, a prototype ocean power plant and cooling system will be installed at the SeaTech facility.

Core Facility – To establish the core facility at the SeaTech campus, new equipment will be purchased that include a variety of shore based sensors, computer systems, and testing apparatus. One technical person (\$100,000) and supplies (25,000) will be used to set up, operate, and maintain the core facility. The total funding requested for this task is \$235,000. The capital purchases are:

- \$40,000, high power computers will be purchased for engineering, computer modeling and simulation, data acquisition and processing, and data storage;
- \$40,000, engineering design software will be used to support the engineering and design of ocean energy systems, specific software packages include Solidworks, Aqua, Rhino, and Ansys;
- \$8,800, an underwater 6 component load cell manufactured by Advance Mechanical Technology Incorporated will be used to measure loading on scale models used in the FAU wave and flow tank; and
- \$21,200 (2 @ 10,600), two Acoustic Doppler Velocimeters manufactured by SonTech will be used to measure the currents and flow fields during model testing in FAU's flow tanks and offshore.

Testing Range – to develop an ocean technology testing and evaluation range, the existing South Florida Testing Facility's offshore range is to be instrumented with fixed and mobile arrays of sensors for measuring environmental conditions, such as current, waves, temperature and salinity. As well, several sensor nodes will be installed along an existing cable, extending from the shore to 15 miles offshore. This will allow instruments, cameras, and other required sensors to be attached in a plug-and-play fashion, and to connect directly with our shore facilities for communication and powering. Funds are requested to support two technical people and a machinist who will design, engineer, and fabricate the nodes and other systems necessary to house and install the various sensors (\$350,000). This effort will be supported by an electrical engineer and a mechanical engineer already funded on state lines at SeaTech. Supplies totaling \$80,000 are needed to build various supporting structures, such as mooring, as well as maintain the various sensors. In order to install and maintain the underwater sensors, Harbor Branch and FAU will provide use of their vessels and underwater support equipment as necessary, including Remotely Operated Vehicles and Autonomous Underwater Vehicles (\$250,000). The total funding requested for this task is \$1,692,500. The capital equipment needed to support this effort are:

- \$212,000 (4 @ \$53,000 each), four 75 kHz LongRanger Acoustic Doppler Current Profilers (ADCP) manufactured by RD Instruments will be mounted in subsurface

moorings and connected to the underwater cable to measure the subsurface ocean current at various locations in deep water;

- \$27,500, one 300 kHz ADCP manufactured by RD Instruments will be mounted in a subsurface mooring and connected to the underwater cable to measure the subsurface ocean current at a fixed location in shallow water;
- \$60,000 (4 @ \$15,000), four syntactic foam deep water mooring balls manufactured by Floatation Technologies are to be used to house the 75 kHz LongRanger ADCPs in the deep water and provide the necessary flotation to recover the units for maintenance;
- \$60,000 (10 @ \$5,000), 10 acoustic release systems are to be purchased from InterOcean Systems to provide the redundant remote release of the deep water moorings;
- \$200,000, a SeaSonde ocean current radar will be purchased from CODAR Ocean Sensors to measure the surface current and waves over much of the range, offshore the SeaTech Facility;
- \$100,000, one range support vessel is proposed to augment the larger vessel capabilities while performing smaller day-to-day missions in a more cost effective manner;
- \$40,000, one self contained SeaBird 911 plus CTD will be purchased from SeaBird to measure water properties while profiling from the small range support vessel;
- \$75,000, one 75 kHz Phased array ADCP manufactured by RD Instruments will be mounted on the hull of the proposed small research vessel to provide a mobile system to measure the ocean current to depths greater than 600m;
- \$100,000, 1 – 2 mile section of armored electrical and optical cable is needed to connect the sensors to the existing underwater cable; and
- \$138,000 (4 @ 34,500), four nodes are needed to interface the underwater cable and the various sensors.

Prototype Ocean Power Plant and Cold Water Cooling System – As part of the Center of Excellence in Ocean Energy Technology, FAU will implement a prototype ocean power plant and cooling system at FAU’s SeaTech Campus to assess its effectiveness, make improvements, and provide projections of impact of commercial systems. To accomplish this, one technical person (\$125,000) will be dedicated to the design of the system, supported by research efforts and an electrical engineer and a mechanical engineer already on state funding lines at SeaTech. Supplies (\$23,000) and cold water pipe components (\$441,500) are needed to fabricate the offshore pipeline. Ship time (\$100,000) is needed to install the pipes. The total funding requested for this task is \$689,500.

Research and Training

A significant amount of the funds will be used in graduate student and postdoctoral workforce training programs. The high caliber of science and novelty of the Center’s research activities coupled with higher than average salaries is expected to attract the best applicants to this program. Postdoctoral fellows will receive an annual salary of \$50,000 (plus benefits – 30% of salary), Ph.D. level graduate students will be paid \$20,000 per year and Masters level students will be paid \$15,000 per year. With the two years of state funding, we aim to support 8 postdoctoral researchers (\$1,040,000), and 11 Ph.D. and 5 Masters level students (\$576,000).

Ocean Energy Systems (including harvesting, cold water, hydrogen, and fresh water technologies) – Research efforts will aim at developing viable technologies for ocean energy harvesting, cold water cooling, and hydrogen and fresh water generation. As such, most of the research effort is focused in these areas. Faculty members from FAU and UCF will be the primary research leaders and graduate student mentors (\$740,000), supported by 5 postdoctoral

researchers (\$650,000) and 6 Ph.D. and 4 Masters students (\$369,954) requiring \$277,798 for tuition. Supplies (\$155,000) are needed to conduct laboratory and at sea experiments with associated ship usage (\$100,000). To facilitate technical exchange meetings with the Center's participants, meetings with state and federal agencies, and to fund faculty and student travel to conferences, \$35,000 of travel funding is requested. The total funding requested for this task is \$2,327,752.

Environmental Assessment and Characterization – Research efforts will aim at characterizing the ocean environment where the ocean harvesters will be deployed, performing environmental impact studies, and assessing and discovering Florida's ocean energy. Faculty members from FAU and Nova Southeastern University will be the primary research leaders and graduate student mentors (\$320,000), supported by 2 postdoctoral researchers (\$260,000) and 3 Ph.D. students (\$123,627) requiring \$83,339 for tuition. Supplies (\$53,000) are needed to conduct laboratory and at sea experiments with associated ship usage (\$120,000). To facilitate technical exchange meetings with the Center's participants, meetings with state and federal agencies, and to fund faculty and student travel to conferences, \$14,000 of travel funding is requested. The total funding requested for this task is \$968,966.

Materials and Composites – Research efforts will aim at developing new materials, coating, and composites that will aid in the development of viable ocean energy systems. Faculty members from FAU will be the primary research leaders and graduate student mentors (\$149,115), supported by 1 postdoctoral researchers (\$130,000), and 2 Ph.D. students (\$82,418) requiring \$55,560 for tuition. Supplies (\$53,000) are needed to conduct laboratory and at sea experiments with associated ship usage (\$120,000). To facilitate technical exchange meetings with the Center's participants, meetings with state and federal agencies, and to fund faculty and student travel to conferences, \$11,000 of travel funding is requested. The total funding requested for this task is 481,093.

Competitive Grant Funding

As part of the technology development plan, the Center of Excellence in Ocean Energy Technology will solicit proposals to fund the development, testing, and commercialization of promising technologies related to ocean engineering. All proposals must culminate in the implementation of a prototype system capable of producing a base load. As such, 30 percent of the overall Center's funding will be dedicated to this effort. Between two and five grants are envisioned to be funded for a total of \$3,000,000.

Outreach

Seminar Program, Symposia, and Outreach – Funds will be used to support a seminar program and public symposia for public outreach. As well, we will work with local high school marine magnet programs, hosted high school summer workshops, and created dual credit earning classes. The COEOET will also host a summer high school program in ocean energy (\$30,000)

Industry Training – FAU will develop an executive education program that will enhance the decision making skills of executives from academia, business, government and civic organizations concerning ocean energy technologies, including research, educational, financial, communications, and related planning and development aspects. Funding is requested to cover faculty salaries (\$90,000) and supplies (\$9,000). The total funding requested for this task is \$99,000.

Overhead

Technology Transfer – FAU’s Office of Technology Transfer will take the lead in coordinating the Center’s partners to establish an industry/economic development centric technology transfer initiative. Enterprise Development Corporation will assist Center faculty and staff with the creation, growth and diversification of technology-based businesses. EDC has a process and support services in place to assist technology development from concept through commercialization, and will focus heavily on industry relations and the role of industry and economic development organizations in the development and commercialization of new products. EDC will work closely with FAU’s Office of Technology Transfer to coordinate efforts. \$130,000 is budgeted to supplement EDC staff to complete these tasks. FAU is the lead institute for this Center and will provide the staff to coordinate Center activities. \$70,000 is budgeted for salary support. To cover travel costs for meeting with industry and state and federal agencies, \$7,000 in travel funding is requested. The total funding requested for this task is \$207,000.

Administration – FAU is the lead institute for this Center and will provide the staff to coordinate Center activities (\$242,190). Funding is requested to cover the supplies consumed in day-to-day activities related to the Center (\$7,000) and travel of the staff (\$20,000). The total funding requested for this task is \$269,190.

The total funding requested for all overhead categories is 476,190 or five percent of the requested task funding.