SBIR

Small Business Innovation Research Program

ABSTRACTS OF PHASE II AWARDS FOR FISCAL YEAR 2022

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

INTRODUCTION

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), awarded 12 NOAA SBIR Phase II contracts for FY 2022, through the Small Business Innovation Research (SBIR) program.

In Phase II, funding is provided for projects that are most promising after Phase I is completed from the previous year. These awards are up to $500,000 each, totaling approximately $6M in FY 2022. The awards are for a two-year effort to continue the research and development of the innovative approach they proposed during the Phase I project. Abstracts of successful Phase II proposals and comments on their anticipated results are also provided in this publication.

FY 2022 Phase II List of Awardees

Award Number	Company Name	Subtopic Number
NA22OAR0210494	Arete Associates, Inc.	9.1
NA22OAR0210496	Live Advantage Bait, LLC	9.1
NA22OAR0210498	Radmantis, LLC	9.1
NA22OAR0210501	Tampa Deep-Sea X-plorers, LLC	9.1
NA22OAR0210493	Elder Research, Inc.	9.2
NA22OAR0210492	Synthetik Applied Technologies, LLC	9.3
NA22OAR0210495	Toyon Research Corporation	9.3
NA22OAR0210489	Nearview, LLC	9.4
NA22OAR0210497	StratoSolutions, Inc.	9.4
NA22OAR0210500	Cell Matrix Corporation	9.5
NA22OAR0210491	InferLink Corporation	9.5
NA22OAR0210490	Sunburst Sensors, LLC	9.5

FY 2022 PHASE II AWARD WINNER

FIRM:	Arete Associates, Inc. 9301 Corbin Avenue, Ste 2000 Northridge, CA 91324
AWARD:	$499,986.00
PHONE:	571- 255-4070
E-MAIL:	ContractsX@arete.com
PRINCIPAL INVESTIGATOR (PI):	Steven P. Anderson

TITLE OF PROJECT:	Infrared Polarimetric Wave Imaging (I-PWI) for Passive Remote Sensing of Sea State
SUBTOPIC NUMBER:	9.1

TECHNICAL ABSTRACT:

The ocean surface is a dynamic and challenging work environment where knowledge of sea state and surface currents is critical for safe and effective operations. We propose to develop a new Infrared Polarimetric Wave Imaging (I-PWI) sea state sensor. I-PWI will be deployed on offshore structures such as oil platforms and wind turbines. The technology complements existing monitoring capabilities including a real-time, NOAA maintained data buoy array, numerical models, and regional ocean observation systems. I-PWI leverages new camera technology and recent advances in the physical understanding of Structure from Polarization (SfP) to capture surface slope fields used to derive sea state (wave height, period, and directional wave spectra). I-PWI also uses well-established space-time processing techniques to provide estimates of surface currents from image sequences. The system (camera and processing module) is mounted well above the sea surface, and looks down and away from the platform. This configuration reduces installation and maintenance cost relative to in situ instruments and buoys, and avoids wake contamination from the platform. The Phase II effort, if awarded, will demonstrate a prototype I-PWI system in an operationally relevant environment and advance the commercialization plans and market acceptance by publishing results and securing commitments from key stakeholders.

SUMMARY OF ANTICIPATED RESULTS:

The proposed I-PWI sea state sensor addresses the needs of three market segments: Offshore Energy, Civil Government (including NOAA), and Defense. Our initial commercial “beachhead” is offshore energy exploration and production industry. Globally, there are well over 500 offshore oil and gas platforms. This in itself provides a sizable near-term market opportunity. We will then work with NOAA and the U.S. Navy to adapt the technology to meet their specific needs and requirements.

FY 2022 PHASE II AWARD WINNER

FIRM:	Live Advantage Bait, LLC 5728 Old Fort Jupiter Road Jupiter, Florida 33458
AWARD:	$500,000.00
PHONE:	561-818-0173
E-MAIL:	nkirchhoff@gmail.com
PRINCIPAL INVESTIGATOR (PI):	Nicole Kirchhoff

TITLE OF PROJECT:	Rapid diagnostic testing for marine velvet disease, Amyloodinium ocellatum: a potential game changer for disease prevention and economic gain for fisheries and aquaculture
SUBTOPIC NUMBER:	9.1

TECHNICAL ABSTRACT:

One of the most prominent challenges for the safe cultivation and maintenance of animals is control of infectious diseases. A. ocellatum is a parasitic infection that impacts all fish within the wide environmental range resulting in mass moralities in captivity. With a broad host and geographic range, all fish in aquaculture ($10B annually), aquarium trade species ($278M annually), and conservation species ($7.6B), or a total of $18B annually are susceptible to A. ocellatum. Due to its rapid onset, there are often no signs of infestation before mortalities begin to appear within a system, making it imperative to diagnose and treat as early as possible. Current methodologies for detecting A. ocellatum are insufficient to circumvent outbreaks. This project builds on two innovative approaches proven successful in our Phase I project: (1) Using Base Pair's patented VENNMultiplex SELEX™ approach we will develop aptamers that are selective for the dinospore and trophont phases of the parasite and (2) develop a pre- and final filtration device to reduce contaminants and concentrate infectious particles water to enhance detection limits.

SUMMARY OF ANTICIPATED RESULTS:

Biosecurity and the costs of infection with *A. occelatum* can risk the financial security and sustainability of fish holding and culture, with a cost each year estimated at $900 million. For this reason, *A. occelatum* was ranked as one of the highest diseases of concern for industry. Our aim is to develop a rapid diagnostic test that can alert the aquarist of infection and or screen new animals before introduction to a tank. Through this project we anticipate (1) development of a laminar flow test strip with three binding regions (one for dinospore, trophonts, and both dinospores and trophonts) and a control which will enable a farmer to determine if their aquarium system in infection with *A. occelatum* while also understanding how entrenched the infection is within their system. We will also (2) develop a commercial ready pre- and final filtrations system to enhance detection limits in an aquatic environment and reduce interfering particles. These two innovations will be combined into a final commercial ready kit for rapid on farm testing for *A. occelatum* and eventual manufacturing and sale. In addition, each of these products will be novel in the industry and can be used as a jumping off point for more product development, i.e. development of lateral flow tests for other aquatic diseases and/ or use of pre-filtration and concentration methodology to enhance disease detection limits in aqueous environments. On-farm testing capabilities as well as rapid and low cost make this product novel in the industry and would make it an invaluable tool worldwide for aquaculture, aquarium, and aquatic conservation industries.

FY 2022 PHASE II AWARD WINNER

FIRM:	Radmantis, LLC 5470 Larchwood Ln Toledo, OH 43614
AWARD:	$500,000.00
PHONE:	419-378-4253
E-MAIL:	rh@radmantis.com
PRINCIPAL INVESTIGATOR (PI):	Robert Huber
TITLE OF PROJECT:	Adapting existing technologies to improve seafood production and feed a hungry world
SUBTOPIC NUMBER:	9.1

TECHNICAL ABSTRACT:

Expansion of aquaculture production depends crucially on the development of technologies that are able to add uncrewed management capabilities to fish farming operations, i.e., the ability to control the tank's population remotely and without human presence. The present project aims to expand our successful Phase I feasibility research toward commercializing an autonomous device that can be inserted into established aquaculture workflows. The result will be a flexible, and adaptable, automated system that permits the sorting and handling of fish based on selected phenotypic characteristics of interest, including growth rates/condition, health status, skin abnormalities, parasitic load, morphological features, or behavior. This system will enhance productivity by reducing stress and injury from human handling, and increase the quality and quantity of the product raised in intensive cultivation. Results of our Phase I feasibility confirm that the time for autonomous methods, uncrewed devices, and AI-assisted robotics in aquaculture is now.

SUMMARY OF ANTICIPATED RESULTS:

Building on a successful Phase I research, we ultimately aim to fill a crucial need in global food security. Our Automated Fish Handler will launch into a rapidly expanding market for precision aquaculture technologies, an area of major importance to a growing world, and with the promise of modernizing inefficient aquaculture practices. Our marketing plan envisions an up-front system purchase (or lease) by a customer, accompanied by a long term subscription plan providing access to a backend data management system.

FY 2022 PHASE II AWARD WINNER

FIRM:	Tampa Deep-Sea X-plorers, LLC 14007 Clubhouse Circle, Suite 706 Tampa, FL 33618
AWARD:	$500,000.00
PHONE:	813-999-6043
E-MAIL:	elarson@tampadeepsea.com
PRINCIPAL INVESTIGATOR (PI):	Edward Larson

TITLE OF PROJECT:	Tampa Deep Sea Xplorers Compact Low Cost AUV Platform for Next Generation Seafloor and Water Column 3D Imaging Sensors
SUBTOPIC NUMBER:	9.1

TECHNICAL ABSTRACT:

Lidar has revolutionized the collection of archeological, geographical, and cartographic data on dry land. Its use below the water's surface however has been severely limited. Tampa Deep Sea Xplorers (TDSX) is proposing to develop a compact underwater Lidar system for use on small ROVs and AUVs. TDSX proposes to continue the Phase 1 collaborative effort between TDSX and BeamSea Associates to complete development of a Lidar system to accurately and reliably collect data from small AUVs. The proposed project will use data and knowledge gained in Phase 1 to build, test, and commercialize the compact Lidar system. The Phase 2 project will continue the work using the TDSX Barracuda AUV platform, which is suitable to prove that a lightweight compact Lidar system can be integrated, internally or as an add-on module, into micro and mini-ROVs/AUVs. The proposed research has the potential to put a state-of-the-art data collection platform into the hands of individuals, small institutions, and research laboratories that otherwise would not be able to afford an underwater Lidar mounted on a remote vehicle for subsea data collection.

SUMMARY OF ANTICIPATED RESULTS:

The proposed development of a mobile underwater Lidar system integrated into a mini-AUV platform will substantially increase the speed and quality of data collection in the subsea environment. There are currently no subsea Lidar systems in the market that could be integrated with a mini-AUV and this necessitates the development project. Current subsea Lidar systems are large and expensive. This puts them out of reach for individual users and small research institutions, due to the expense of the equipment and the logistical needs of a large AUV system. TDSX's development will change the landscape of the mini-AUV market and put new state-of-the-art technology at the fingertips of thousands of individuals and researchers.

FY 2022 PHASE II AWARD WINNER

FIRM:	Elder Research, Inc. 300 W Main St., Suite 301 Charlottesville, VA 22903
AWARD:	$499,906.00
PHONE:	434- 973-7673
E-MAIL:	debbie.owen@elderresearch.com
PRINCIPAL INVESTIGATOR (PI):	Jennifer Schaff, Ph.D.
TITLE OF PROJECT:	HABSSED: Harmful Algal Bloom Surveillance by Sequencing of Environmental DNA
SUBTOPIC NUMBER:	9.2

TECHNICAL ABSTRACT:

Harmful algal blooms (HABs) represent a significant problem for the Blue Economy, adversely affecting drinking water, commercial fisheries, water recreation, and tourism. Early detection of HABs is crucial in mitigating their effects. We propose to continue our development of HABSSED (Harmful Algal Bloom Surveillance by Sequencing of Environmental DNA) into the prototyping phase. The HABSSED pipeline, once completed, will be a novel, rapid, inexpensive surveillance technique for detecting HABs by leveraging abundance of microbial taxa in the environment, measured through eDNA sequencing. The pipeline will be simple enough to democratize the process, such that citizen scientists and labs with limited funding can benefit from it. For our Phase I work, we successfully demonstrated the feasibility of our approach, by sequencing water samples drawn from Lake Erie GLERLs, and showing differential abundance of Microcystis species between bloom-drawn and pre-bloom samples. Our Phase II plans are to develop a prototype pipeline that incorporates the processes developed in Phase I, but refines each step from sampling, through sequencing, analysis, and predictive modeling. When complete, we believe HABSSED will become an essential tool for any Blue Economy stakeholder in areas where HABs are a concern or likely to become a concern in the future.

SUMMARY OF ANTICIPATED RESULTS:

The commercialization pathway for HABSSEDis a tiered, non-profit, consortium mode. Most of the stakeholders that were interviewed at the end of our Phase I came from environmental advocacy groups or research institutions. Other smaller stakeholders (e.g., charter fishing, ecotourism) represent a potential market of otherwise disparate/disconnected entities who share a common interest in better HAB understanding and forecasting, but do not have either the money or expertise to pay to access such a capability individually. By contrast, larger commercial fishing and aquaculture have in-house marine biologists and ecologists, as well as greater financial resources to support HAB study.

FY 2022 PHASE II AWARD WINNER

FIRM:	Synthetik Applied Technologies, LLC 28696 Tree Farm Rd Pierre, SD 57501
AWARD:	$497,263.00
PHONE:	360-441-5010
E-MAIL:	hatfield@synthetik-technologies.com
PRINCIPAL INVESTIGATOR (PI):	Joshua Hatfield
TITLE OF PROJECT:	DeepSpace-AI - A Deep-Learning Based Environmental Monitoring System Using Satellite Imagery
SUBTOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

Environmental monitoring and forecasting for marine, coastal and terrestrial environments plays a critical role in informed decision making for a wide range of stakeholders in government and regulatory agencies, private industry, and the scientific community. The need for high-quality rapid data and analytics is becoming increasingly important in the face of a changing climate, which threatens to disrupt ecosystems, alter global weather patterns, and increase the frequency and severity of extreme events across the globe. We propose to develop the DeepSpace-AI platform, for automated monitoring and forecasting of environmental phenomena on a global scale. The DeepSpace-AI platform will automate the import of satellite imagery and complementary data streams for areas of interest, and process this data using a range of machine learning models for object-detection, area-based segmentation, and forecasting. Additionally, the platform will include assisted annotation tools supporting efficient user-generation of custom analysis models.

SUMMARY OF ANTICIPATED RESULTS:

The DeepSpace-AI platform will dramatically increase accessibility to environmental observation data, and democratize the use of ML inferencing to process this data for monitoring and forecasting in a range of applications. This tool will make processing of data more efficient, by providing a single-source clearinghouse for data ingestion, and providing machine assisted annotation tools for ML model development. By implementing free-to-use data, we will seek to increase utilization of AI technology across government and industry. Anticipated commercial applications of the technology include quantification of risks associated with extreme events such as floods and wildfires in the insurance industry, as well as siting and impact studies for offshore industries such as aquaculture and energy facilities.

FY 2022 PHASE II AWARD WINNER

FIRM:	Toyon Research Corporation 6800 Cortona Drive Goleta,CA 93117
AWARD:	$500,000.00
PHONE:	805-450-0686
E-MAIL:	ksullivan@toyon.com
PRINCIPAL INVESTIGATOR (PI):	Kevin Sullivan

TITLE OF PROJECT:	Detecting and Classifying Marine Mammals in Infrared Video Using AI
SUBTOPIC NUMBER:	9.3

TECHNICAL ABSTRACT:

We propose to develop a system that can automatically detect marine mammals day and night for extended periods of time using infrared video cameras and custom software. We plan to make use of commercial long wave infrared (LWIR) cameras. For vessel-based data collections we will use a custom camera developed by Toyon that stabilizes imagery electronically using data from a low-cost inertial navigation system (INS). Stabilized video from multiple imagers will be sent to a detector where human- designed algorithms will be used to find potential locations of marine mammals. Video will be clipped spatially and temporally around each detection and the resulting video clip will be sent to a deep neural network classifier that uses artificial intelligence (AI) techniques to classify the video clips. Further development of the AI module will be the primary focus of this effort and this will entail the collection and formatting of large volumes of data as well as the evaluation of multiple architecture models to determine the best for this application. A fully functioning real-time system will be created and demonstrated to NOAA staff as well as potential Phase III partners..

SUMMARY OF ANTICIPATED RESULTS:

The successful completion of this research and development effort will be a system that can automatically detect marine mammals day and night for extended periods of time. This technology has multiple applications including ship strike mitigation for commercial shipping lines and cruise ships, support for military operations to reduce the exposure of marine mammals to loud acoustic sources during testing and peacetime operations, monitoring to reduce impacts of acoustic signals from industrial exploration and construction projects such as oil, gas and offshore wind farm projects, and monitoring of marine mammals for biological research such as abundance estimates.

FY 2022 PHASE II AWARD WINNER

FIRM:	Nearview, LLC 36 Maplewood Ave Portsmouth, NH 03801
AWARD:	$500,000.00
PHONE:	207-200-7879
E-MAIL:	stefan@nearview.net
PRINCIPAL INVESTIGATOR (PI):	Stefan Claesson
TITLE OF PROJECT:	AI Model and Platform for Automated Detection and Mapping of Intertidal Vegetation
SUBTOPIC NUMBER:	9.4

TECHNICAL ABSTRACT:

There is a growing need for a single source of truth data about intertidal zones that can be used by lawmakers, resource managers, conservationists, engineers, pharmaceutical and food manufacturers, farmers and fishers, and scientists for better environmental planning and protection, particularly for the land-sea interface. Our Phase II research will solve this challenge by developing a data analytics platform that 1) compiles explicit oceanographic, biological, and spectral data gathered over time for macroalgae in intertidal zones, 2) performs objective, high-accuracy analyses leveraging Machine and Deep Learning technologies, 3) provides an AI-driven platform built to produce accurate results at multiple scales, and 4) distributes data and insights that can be consumed by organizations through an easy cloud-based, graphical user interface (GUI). The platform will deliver data solutions that incentivize conservation of resources, automate workflows enabling efficient and accurate modeling, offer simple and intuitive self service interfaces, and provide analytics and insights by experts.

SUMMARY OF ANTICIPATED RESULTS:

Our AI/ML-driven analytics platform will allow users to rapidly ingest, aggregate, and analyze geospatial data relating to intertidal resources from multiple inputs (e.g., field research, drone, and satellite sensors). The platform will provide: 1) a comprehensive metadata repository that is secure and compliant with FGDC standards, 2) rapid analytics and insights through the application of AI/ML models, and 3) open-source data libraries and warehouses for research and analysis. These earth observation tools, models, and innovative workflows will be deployed to deliver automated map products relating to the ‘Blue Economy’ (e.g., carbon sequestration estimating and budgeting) to conservation authorities, government agencies, municipalities, and various stakeholders (e.g., seaweed harvesters, environmental engineers, NGOs). The proposed platform will improve access to geospatial data for decision-making, and support sustainability and resilience of coastal environments from natural and human impacts.

FY 2022 PHASE II AWARD WINNER

FIRM:	StratoSolutions, Inc. 33555 N Ivy Ln Grayslake, IL, 60030
AWARD:	$500,000.00
PHONE:	847-802-9048
E-MAIL:	rchan@stratosolutionsinc.com
PRINCIPAL INVESTIGATOR (PI):	Raymond Chan

TITLE OF PROJECT:	Application of Mini-Dropsonde-equipped HAB for Targeted Observations of Extreme Weather
SUBTOPIC NUMBER:	9.4

TECHNICAL ABSTRACT:

There is a clear need to improve weather forecasting accuracy. The greatest contribution to forecast uncertainty is a lack of meteorological observations over remote areas and areas experiencing pronounced convective activity. StratoSolutions' new high-altitude balloon (HAB) platform with mini-dropsonde is a disruptive new uncrewed meteorological observation data source able to collect data at regular intervals over the course of several days from remote regions in a cost-effective manner. This will result in reliable and accurate observations with high vertical resolution from remote areas of the globe benefit multiple industries and provide improved early forecasting. In this effort, HAB launch campaigns will be performed targeting tropical storms in the Atlantic and atmospheric rivers in the Pacific. Weather data will be collected and assimilated into weather models to determine forecast improvement against existing forecasts and actual weather conditions.

SUMMARY OF ANTICIPATED RESULTS:

The proposed through life weather data collection cost for this new mini-dropsonde system will be less than $250 per dropsonde data set compared to the cost today that can run up to $5,000 per data set for special targeted dropsondes missions such as tropical storm coverage over the Atlantic. Moreover, StratoSolutions' HAB platform with the integrated miniature dropsondes will not only increase the accuracy of data collection but also bring the overall cost of meteorological data collection. StratoSolutions envisions establishing or contributing to a commercial weather data exchange where it could task its HAB systems to gather data based on customer requests. The insurance industry stands to benefit since the additional data will help provide better forecast warming of extreme precipitation events and mitigation of flooding risk. Further commercialization value comes from the potential to perform better water resource management and prevent or reduce the impact of dry season droughts by reducing the flooding false alarm rate and preserving statistically higher average reservoir water levels which help to mitigate the huge economical damage caused by droughts.

FY 2022 PHASE II AWARD WINNER

FIRM:	Cell Matrix Corporation 909 University City Blvd, Unit 10038 Blacksburg, VA, 24062
AWARD:	$500,000.00
PHONE:	540-230-0885
E-MAIL:	ccr3@cellmatrix.com
PRINCIPAL INVESTIGATOR (PI):	Dr. Lisa J.K. Durbeck

TITLE OF PROJECT:	Participatory Sensor Networks for Marine Navigation
SUBTOPIC NUMBER:	9.5

TECHNICAL ABSTRACT:

The primary objective of this project is to improve awareness, safety and enjoyment for mariners in coastal and inland waters by the creation of a participatory sensor network (PSN) that facilitates sharing of marine observations with other mariners. We are adding a new degree of temporal fidelity to nautical charts and maps. The approach leverages volunteered geographic information to augment conventional marine navigation with timely updates of ephemeral features such as navigational hazards, and is driven by a community consisting of recreational boaters, recreational and commercial fisherman, and other marine professionals. A low cost zero-install optical sensor that uses machine learning to recognize a wide variety of marine objects assists in automatically reporting observations. The service we intend to offer is free to use for all mariners.

SUMMARY OF ANTICIPATED RESULTS:

This project has the potential to provide lasting public benefits for the vast majority of recreational boaters and professional mariners. Ship navigation incidents can result in serious loss of life and property, and pollution of the marine environment. Increased awareness of the dynamics of coastal sea-state benefits the individual mariner on the water, military ships, and the search and rescue community, and adds to global coastal cognizance. As digital nautical charts become the predominant source of information for mariners, maps can easily contain additional layers of ephemeral information that moves about, such as crab and lobster traps, shipping channel traffic and tagged right whales.

The question is how to efficiently collect, curate, trust and disseminate this nonpermanent, ephemeral information that affects safety of navigation. In the first phase of this project, the CMC/VT team focused on demonstrating concept viability by resolving key technical issues in the design and cost of an onboard marine optical sensor to automate sightings, the backbone network and databases, social deployment strategies, power efficiency, automating object detection and recognition, and data fusion for scene understanding. With viability demonstrated, the next phase of the project will scale up the backbone computing infrastructure and analytic capabilities, fabricate a sensor through limited production, and move towards experimental deployment.

FY 2022 PHASE II AWARD WINNER

FIRM:	InferLink Corporation 2361 Rosecrans Ave., Suite 348 El Segundo, CA 90245
AWARD:	$500,000.00
PHONE:	310-341-2446
E-MAIL:	sminton@inferlink.com
PRINCIPAL INVESTIGATOR (PI):	Steven Minton
TITLE OF PROJECT:	Auto-Transcription for Citizen Science
SUBTOPIC NUMBER:	9.5

TECHNICAL ABSTRACT:

We propose to implement a system for automatic transcription of tables from handwritten or typed document images. In phase I we developed an end-to-end system design and showed the feasibility of our approach with a working prototype to take document images as inputs and extract a digital, tabular output. In phase II we will fully implement the end to-end system. Our work will focus on three tasks. The first is the implementation of the front-end user interface, which will allow users to create “templates" for transcription jobs, provide guidance, and correct the output. The second task focuses on implementing the back end, which employs highly accurate models that can incorporate user knowledge about the tables to be transcribed. Finally, in addition to the implementation work, we will evaluate the system’s ultimate accuracy, deploy the system, conduct user testing, and refine the implementation in response to feedback. This man-machine combination of user input, and models capable of using the input, will allow transcription to be efficiently and accurately accomplished, even in cases where the system does not initially produce a perfect result. Our system will empower citizen scientists to accomplish transcription tasks quickly, intuitively, and easily.

SUMMARY OF ANTICIPATED RESULTS:

The primary result of this project will be a software system for automatic transcription of tables from handwritten or typed document images. The system will enable citizen scientists to carry out large transcription tasks quickly, intuitively, and easily. This will provide significant benefit not only to NOAA but also other data centric agencies and enterprises that need digital access to data embedded in legacy typed and handwritten documents. We plan to offer this system for use by citizen scientists and non-commercial enterprises at no charge. In addition, we plan to develop a commercial extraction product for enterprise customers. In this product the table transcription technology will be combined with text extraction and analysis capabilities to provide an integrated system for entracting, aggregating, and analyzing data in technical documents.

FY 2022 PHASE II AWARD WINNER

FIRM:	Sunburst Sensors, LLC 1226 W Broadway St. Missoula, MT 59802
AWARD:	$499,986.00
PHONE:	406-532-3246
E-MAIL:	jim@sunburstsensors.com
PRINCIPAL INVESTIGATOR (PI):	Dr. Reggie Spaulding

TITLE OF PROJECT:	The pHyter and Other Oceanographic Tools for Citizen Science and STEM Education
SUBTOPIC NUMBER:	9.5

TECHNICAL ABSTRACT:

The pHyter is a handheld device that accurately measures pH using colorimetry, communicating with a cellphone via Bluetooth Low Energy. The app records location, time, temperature, pH and meta-data. In Phase I, we redesigned the instrument using an 'internet of things' development platform, modified the app to operate on both Android and iOS phones, and showed, through a network of partners, that it is an excellent tool for coastal pH measurements, education, and citizen science. With this technology, we have the basis to develop inexpensive instrumentation for citizen scientists and students to measure other important water quality parameters, such as total alkalinity (TA), fluorescent dissolved organic matter (FDOM), the partial pressure of CO2 (pCO2), and the differential pressure of CO2 in air/water (DCO2). With Phase II funding we will develop inexpensive TA, FDOM, pCO2, and DCO2 measurement systems, and a 'pHyterPro' (higher accuracy pHyter), while working closely with educators to facilitate curriculum development. Additionally, we will develop a web portal for access, storage, and visualization of the data from the devices. Following NOAA objectives, we will strive to make these data sets "…accessible, usable, understandable, and relatable to students, citizen scientists, and the public," by responding to user feedback.

SUMMARY OF ANTICIPATED RESULTS:

Phase II funding will improve the durability, useability and accuracy of the current Phyter design, and produce a line of similar smartphone app-controlled, low-cost water quality instruments and a web-based data storage and visualization portal. The instruments and website will be useful tools for measuring and studying coastal ocean acidification (COA) by citizen scientists and STEM education programs. Working closely with our partners in citizen science and education will result in development of classes and curriculum to teach about COA and directly engage students in environmental measurements. These products will fill a gap in the market for high-quality, low-cost instrumentation.