

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Cindy Fowler

NOAA Coastal Services Center, 2234 South Hobson Ave., Charleston, SC 29405-2413,
cfowler@csc.noaa.gov

Florence Wong

USGS, 345 Middlefield Road, Menlo Park, CA 94025, fwong@usgs.gov

Bernard Bauer

Department of Geography, University of Southern California, Los Angeles, CA 90089-0255,
bbauer@usc.edu

Phil A. McGillivray

Coast Guard Pacific Area, Bldg. 51-5, Coast Guard Island, Alameda, CA 94501-5100,
pmcgillivray@d11.uscg.mil

Joann Mossa

Department of Geography, P.O. Box 117315, 3141 Turlington Hall, Gainesville, FL
32611-7315, mossa@geog.ufl.edu

REVIEWERS NOT TO INCLUDE:

Not Listed

PROJECT SUMMARY

The Project Summary should include a statement of objectives, methods to be employed, and the significance of the proposed activity to the advancement of knowledge or education. Avoid use of first person to complete this summary. **DO NOT EXCEED ONE PAGE.** (Some Programs may impose more stringent limits.)

A sabbatical project is proposed that will allow the investigator to build on her earlier research geographic information science (i.e., building marine data archive and distribution systems and bringing GIS analytical techniques to bear on marine geological/geophysical problems) while applying it to a completely new application area, thus facilitating a new line of basic research inquiry (i.e., a move from deepsea mid-ocean ridge and trench studies to coastal studies such as coral reef ecology, coastal processes and habitat). In addition professional growth will result in the area of *applied* research by way of new knowledge gained about marine sanctuaries, marine protected areas, and coastal resource management. Important new collaborations will be established to this end, both professionally and politically, that aid the investigator in her long-term career goal of overseeing and directing a major research center for coastal and marine environmental studies and geospatial data in the States and abroad. These collaborative ties will be made with the Sustainable Seas Expeditions (SSE), based in Santa Barbara, California, the Fagatele Bay National Marine Sanctuary (FBNMS) in American Samoa, and the broader NOAA Marine Sanctuary Program.

Three specific areas of enquiry, supportive of the major SSE components of exploration, development of ocean observatory and monitoring sites, and resource management issues will be addressed:

- Establishment of a comprehensive, web-accessible data clearinghouse, along with geographic information system (GIS) maps and data layers that have long been needed by FBNMS staff and collaborators in order to carry out sustainability and coastal management programs that are ecosystem-sensitive and have public support.
- Development of spatial analytical procedures for ecological characterization of the coral reef, which in turn should help to establish future survey, monitoring and management protocols.
- A brief exploration of information space modeling as a way to augment the content and accessibility of the data clearinghouse, and evaluation of how much promise this line of inquiry holds for helping to meet the data requirements of the national sanctuary system.

The investigator must be funded by the end of this review cycle in order to catch the momentum of current initiatives and be able to complete the proposed activities in time to be of most utility for planned phases of the SSE (which is already in year 2 of its 5 year program). The timing will be almost perfect, as the initial data sets to be included in the clearinghouse will be collected during the first exploratory mission to FBNMS in March of 2000.

PROJECT DESCRIPTION

New Collaborative Research with the Sustainable Seas Expeditions at the Fagatele Bay National Marine Sanctuary (American Samoa)

1. POWRE Relevance Statement

1.1 Background - Summary of Current Research Specialties

The investigator's appointment to the Department of Geosciences at Oregon State University (OSU) placed her within the Geography *program* (to lead teaching, research, advising, and service in the extremely popular specialty of geographic information systems or GIS). It was also heavily predicated on her ability to foster cross-disciplinary research and teaching in the fields of geography, geology, and deep-water oceanography. This includes the ability to attract students with similar cross-disciplinary interests and to enter into research collaborations not only with the geologists in Geosciences, but with oceanographers in the neighboring College of Oceanic and Atmospheric Sciences (COAS) and the Hatfield Marine Science Center (HMSC) in Newport, Oregon.

The word *research* necessarily includes the pursuit and creation of knowledge, yet the investigator has practiced what geographers commonly designate as *the scholarship of integration*. She has sought to meld discoveries in geography with those from other specialties in order to create larger frameworks of meaning. This has led her to actively participate in two academic communities which, unfortunately, still appear to be fairly unaware of each other: physical geography/geographic information science (GISci) and marine geology/geophysics (deep-water). The investigator has published in leading journals for both communities, often bringing geographic information science techniques to bear on marine geological/geophysical problems while providing leadership within the GISci community for the notion that there exists a potential for GIS to benefit greatly from oceanography (e.g., *Wright et al.* [1995a], *Wright and Goodchild* [1997], *Wright* [1996, 1999a]). For instance, research issues endemic to oceanographic applications of GIS, such as the handling of spatial data structures that can vary their relative positions and values over time, geostatistical interpolation of data sparse in one dimensions as compared to the others, volumetric analysis, and the input and management of very large spatial databases will advance the body of knowledge in GIS design and architecture, as well as the body of knowledge in the broader field of GISci. Her research to this end has focused on scientific information modeling to increase the efficiency of oceanographic spatial data management, and data conversion schemes for easier GIS input of oceanographic data (particularly marine bathymetry) (e.g., *Wright* [1994], *Wright et al.* [1998], *Wright and Bartlett* [in press]).

The investigator's research in marine geology has focused mainly on the fundamentals of fissure formation and development at the crest of mid-ocean ridges, having led or on collaborated several studies of fissuring on the East Pacific Rise (EPR; e.g., *Wright et al.* [1995a and b]; *Wright et al.* [submitted]). Fissures control the gross permeability of ocean crust, providing critical pathways for hydrothermal fluids and magma and lending important clues to the cycling of volcanic and hydrothermal processes and the spatial and temporal stability of ridge segments. And yet due to limitations in mapping technology that existed until the late 1980s, the critically important

parameters of fissure abundance, spacing, length, width, and depth have rarely been reported anywhere on the seafloor, with the exception of the fast-spreading EPR. However, with the increasing availability of high resolution mapping tools, research agendas at various international workshops (e.g., *Purdy and Fryer* [1990], and *Dziewonski and Lancelot* [1995]) are now citing the determination of these parameters as a high priority for morphotectonic studies of the mid-ocean ridge that seek to more fully understand the nature of extensional failure of the ocean crust. The investigator has also worked on active tectonics problems at a convergent margin [*Wright et al.*, in press].

1.2 Career Goals and Advancement

The investigator started her career as an assistant professor in 1995. Her record of research, teaching, advising, and service led to an early promotion to associate professor with indefinite tenure, effective September 15, 1999, and she is eligible for a **sabbatical** leave effective January 1, 2001. The investigator is therefore appreciative of the opportunity to compete for a POWRE award at this critical juncture in her career, which will provide a means by which she can take advantage of an opportunity that will contribute to a significantly new advance in her career path.

As competition for research dollars continues to increase exponentially for "blue-water" deep ocean research, the investigator would also like to explore problems of a more coastal nature, particularly with regard to coral reefs in shallow-water marine sanctuaries. The schism between geography/GIS and coastal studies is not nearly as wide as it is between deep-water research and there are many more opportunities for fruitful collaboration, as well as requests for proposals that explicitly call for an integration of the two fields. The societal implications of studies in these fields are also significantly richer. One major example is the study of coral reefs, which are recognized as being among the most diverse and valuable ecosystems on earth. Reef systems are storehouses of immense biological wealth and provide economic and ecosystem services to millions of people as shoreline protection, areas of natural beauty and recreation, and sources of food, pharmaceuticals, jobs, and revenues. Unfortunately, coral reefs are also recognized as being among the most threatened marine ecosystems on the planet, having been seriously degraded by human overexploitation of resources, destructive fishing practices, coastal development, and runoff from improper land-use practices. As the investigator pursues this new line of research inquiry (i.e., a move from deepsea mid-ocean ridges and trenches to coastal mapping, habitats, and resource management) the opportunities to integrate this research with education will also be much more readily apparent: coral reefs and coastal issues, combined with geographic information science, are "hot topics" which can be integrated into lectures and assignments in a wider variety of existing courses offered at OSU.

A primary career goal of the investigator in this regard is to position herself for a long term career goal of serving as **director of a major research center** for coastal and marine environmental studies and geospatial data (not unlike the NOAA Coastal Services Center on the east coast), to develop and implement an on-going research, educational and outreach program focused on geographic information science as applied to problems of the coast, continental shelf, and shallow reef environments. Specific goals for this "**vision**" include:

- to promote and conduct research on natural and technological hazard risks on in coast, reef and continental shelf environments, understanding of physical processes, monitoring, assessment, mitigation, response, recovery, and communication, through intramural and external funding.
- implementation and coordination of formal curricula dealing with studies of coasts, reefs, associated marine sanctuaries and protected areas, as well as the geographic information science in support these investigations.
- providing a comprehensive point of distribution for relevant data and metadata, including the maintenance of online libraries or clearinghouses; providing assistance to users in locating and accessing data appropriate for their needs.
- working with data providers/users to consolidate data collection activities; ensuring data standards, reducing data duplication, help to provide direction for new data collection initiatives.
- strengthening of ties with governmental agencies at all levels and the private sector for the purpose of accomplishing the above, and extending outreach to the media, schools, and the general public toward action in minimizing risk and destruction of coasts, reefs, and shelf environments.
- development of career opportunities for undergraduate and graduate students through quality education, research activity, internships, co-ops, public service, and a certification program marine/coastal geographic information science.
- promotion of institutional collegiate collaboration regarding research and curriculum as appropriate.

The investigator has made a small start toward this grand vision with her efforts developing a new geospatial clearinghouse for the Oregon coast [Wright, 1999b], in exploring with colleagues the issues surrounding marine sanctuaries and the possibility of proposing a new NOAA marine sanctuary off the Oregon coast, and in joining a recent working group on establishing the aforementioned major research center on the west coast. She views her planned sabbatical experience as an extremely important opportunity to further these efforts and to form vital new collaborations, both professionally and politically, that would not be possible without the support of the POWRE award. To summarize at this point, the professional development aspects of the preceding discussion are:

- Exploratory work to determine the feasibility of a new line of *basic* research inquiry (i.e., a move from deepsea mid-ocean ridge and trench studies to coastal studies such as coral reef ecology, coastal processes and habitat).
- Professional growth in *applied* research as well: new knowledge/training about marine sanctuaries, marine protected areas, and coastal resource management. Use of skills and knowledge to help build the vision of the aforementioned research center as well as with proposals for a new marine sanctuary off Oregon coast.
- Establishment of important new collaborations in the States and abroad (e.g., with NOAA Marine Sanctuary Program and the Sustainable Seas Expeditions here in the continental U.S., as well as with Fagatele Bay National Marine Sanctuary staff and the coastal management community in Samoa and throughout Oceania - all described below).

- Upon the investigator's return to OSU she will incorporate the results of her research and advocacy activities at Fagatele Bay into 2 new courses to be offered at OSU: a regional geography course for undergraduates (GEO 330, Geography of the Pacific), and a graduate seminar (GEO 569 Topics: Remote Sensing of Submarine and Coastal Environments).

Explorations of new avenues of inquiry are not appropriate for a regular research or education proposal, nor are professional development activities such as networking, training and the building of research collaborations toward this end. Therefore, this request is being submitted as a POWRE proposal.

1.3 The Time is Now

The timing couldn't be more perfect to engage in these activities due to recent developments with the national marine sanctuaries and the Sustainable Seas Expeditions. The investigator must get involved within the next year in order to catch the momentum of current initiatives. Again, by way of background, the National Marine Sanctuary System was created in 1972 to protect ecological, historical, and aesthetic resources within vital areas of U.S. coasts [<http://www.sanctuaries.nos.noaa.gov>]. Currently there are 12 official sanctuaries protecting over 18,000 square miles of American coastal waters from American Samoa to Maine and the Florida Keys, including Pacific and Atlantic habitats for whales, sea lions, rays, and turtles, coral reefs, and kelp forests. These sanctuaries are largely unexplored below depths of ~30 m, and there has been no comprehensive documentation of the plants, animals, and submarine topography. A major initiative, administered by NOAA, has recently been launched to explore, document, and provide critical scientific data for these regions, with the goal of developing a strategy for the restoration and conservation of the nation's marine resources [Wilson, 1998]. One of the major catalysts behind this effort is the 5-year Sustainable Seas Expeditions (SSE; <http://sustainableseas.noaa.gov>), led by marine biologist and *National Geographic Explorer-in-Residence* Dr. Sylvia Earle and former National Marine Sanctuary program director Francesca Cava. SSE has been using new technologies, including their 1-personed submersible *DeepWorker*, to pioneer the first explorations of the sanctuaries. Its mission plan includes three phases the first of which is in progress now: to provide the first photo documentation of sanctuary plants, animals, and habitats at depths up to ~610 m. The second phase will expand on the characterization of habitats, focusing on larger animals such as whales, sharks, rays, and turtles, and compare habitat requirements among sanctuaries [Wilson, 1998]. Phase Three will include the all-important analysis and interpretation of the masses of data collected, as well as public outreach and education.

The investigator, due to heavy research and teaching commitments, was unable to answer the initial "call for collaboration" that went out to the marine research community in 1998 to join the expeditions of Phase One and participate in SSE submersible training. However, she had the pleasure of meeting Dr. Earle at a conference this summer and inquired as to the possibility of being included as an additional collaborator, given the needs and goals of the various sanctuaries. Due to recent developments, particularly at the Fagatele Bay Marine Sanctuary (see below), she has a wonderful opportunity to get involved in Phases Two and Three of the SSE, if she can complete the proposed activities for 2001. To wit, an email communication from John

McDonough, SSE mission coordinator, that arrived during the final stages of preparation for this POWRE proposal:

Date: Mon, 06 Dec 1999 08:26:05 -0500
From: "John McDonough" <John.McDonough@noaa.gov>
Organization: NOAA/NOS/Special Projects
To: "Dawn Deepsea" <dawn>, Nancy Daschbach <Nancy.Daschbach@noaa.gov>
CC: Dan Basta <Dan.Basta@noaa.gov>

Our meetings with Sylvia and the National Geographic folks last week went very well, resulting in some refinements to proposed SSE operations in order to better enable us to focus on the goals and objectives of the project. To summarize briefly, one of the primary objectives of SSE has been to enhance site characterization efforts at each sanctuary. Based on our experiences this past year, it is now being proposed to focus exploration and research efforts on characterizing two discrete sites within each sanctuary for comparative assessment. One site would be of special biologic significance (such as a no take zone within a sanctuary or an area exhibiting a high degree of biologic diversity), and the other a site that is significantly less diverse. To accomplish a thorough, ongoing assessment, Sylvia and the Geographic are prepared to invest in an instrument package that could be installed on the bottom at each site to collect standard water quality measurements (i.e., temperature, salinity, conductivity, transmissivity, O₂, etc.). These instruments would remain at these sites for the foreseeable future, allowing data to be collected in between visits. In addition, SSE research efforts at these sites, either using the *DeepWorker* or an ROV [remotely-operated vehicle] or AUV [autonomous underwater vehicle], would focus on specific tasks such as collecting videotape, still photography, CTD data, sediment samples, etc. to add to the characterization of the sites.

In terms of the proposed mission to American Samoa [March 2000], Sylvia has elected not to visit the sanctuary..., allowing more time to further develop the ideas outlined above. This does not mean that there will be no work done at the sanctuary, however. Based on the new focussed approach, the NOS Special Projects Office and the Marine Sanctuaries Division are prepared to continue to work with the sanctuary to identify target locations within (or outside) the sanctuary for a mission in 2001. In essence, this work is complementary to the work you have outlined in objective 1 of your [pre-]proposal.

2.0 Why Santa Barbara and Why the Fagatele Bay National Marine Sanctuary?

The investigator proposes to complete the majority of the project in Santa Barbara where the Sustainable Seas main office is located and where she also has an existing network of marine science and geographic information science colleagues at UC-Santa Barbara. She will also be housed on the UC-Santa Barbara campus, due to lack of office space at SSE (see Facilities and Supplementary Documents sections of proposal).

The Fagatele Bay National Marine Sanctuary (FBNMS; Figure 1) has been chosen as focus because it is one of the last sanctuaries that will be visited by the SSE. Unlike the larger sanctuaries off the coast of the continental U.S. and Hawaii, the science plans for FBNMS are still being developed and refined, due in part to the probability that it will not be visited by the *DeepWorker* submersible in the near future. In addition, because the site is so remote, there is also a much greater need here for large-scale (high-resolution), fully processed, interpreted and accessible baseline data to characterize the sanctuary, as well as new partnerships and input from collaborating researchers. Therefore, of all the sanctuaries targeted by SSE the investigator stands

to make the greatest contribution at Fagatele Bay, especially since she is currently involved in a seafloor mapping project near that region [Wright *et al.*, in press] (see also <http://dusk.geo.orst.edu/tonga>) and has already traveled throughout American Samoa (as well as Fiji and Tahiti). Additional proposed activities can be completed by a 1-2 week stay at the FBNMS.

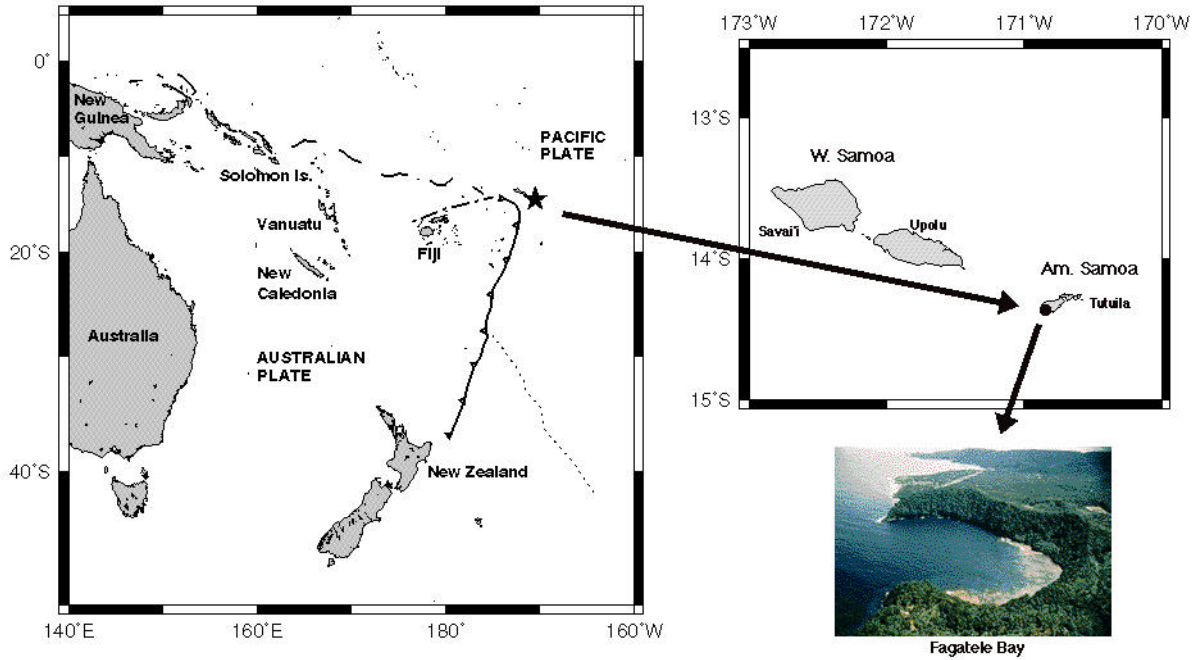


Figure 1. Regional location maps of the study area in the Southwest Pacific. Map on left shows major submarine tectonic features in the region: Tonga Trench (solid line w/barbs on overriding plate), Fiji Fracture Zone and Vitiāz Trench Lineament (dashed line), and Louisville Ridge (dotted line).

Fagatele Bay is an ancient flooded volcano, with a thriving coral and calcareous algal reef community that is rapidly recovering from an infestation of crown-of-thorns starfish that devastated the corals in the late 1970s [<http://www.fbnms.nos.noaa.gov/>]. Although much of the coral cover has been destroyed, fish populations still thrive, particularly surgeonfish, damselfish and angelfish [Akins, 1999]. In addition, the steep slopes surrounding the bay contain some of our nation's rare paleo-tropical rainforest [<http://www.fbnms.nos.noaa.gov/>].

3.0 Proposed Activities

The following proposed activities addresses crosscutting issues of information *infrastructure* that should support three major components of SSE: exploration, development of ocean observatory and monitoring sites, resource management issues [Wilson, 1998]. Collaboration with SSE is proposed with regard to three objectives:

- Establishing a comprehensive, web-accessible data clearinghouse, along with geographic information system (GIS) maps and data layers that can be made available to FBNMS collaborators. These may also be added to the NOAA Protected Areas GIS that summarizes data for all 12 of the sanctuaries [Killpack, 1999]. A GIS data and web-serving machine will be installed and set up at the FBNMS; FBNMS will be provided with introductory training.
- Development of spatial analytical procedures for ecological characterization of the coral reef, which in turn should help to establish future survey, monitoring and management protocols.
- A brief exploration of information space modeling as a way to augment the content and accessibility of the data clearinghouse.

3.1 Objective (1): Data Integration and Management

Developing and carrying out sustainability and coastal management programs that are ecosystem-sensitive and have public support requires that SSE scientists and managers have efficient access to high-quality marine and coastal data. This is particularly crucial for SSE Phases One (understanding species composition and abundance, development of sanctuary program monitoring protocols) and Two (implementation of monitoring protocols and visitation of no-take zones to check on system health or change). Objective (1) is concerned primarily with the integration of existing data into a GIS "clearinghouse" of both data and FGDC-compliant metadata (i.e., data about data) for the FBNMS. These data can then be integrated with subsequent SSE survey data. The clearinghouse will facilitate the continued distribution and synthesis of information on the sanctuary. It will help to integrate a wide range of data sources and allow scientists and resource managers to analyze ecosystem characteristics at large spatial and temporal scales (into the future, or retrospectively with older data sets). It is anticipated that the clearinghouse will also be used as a focus for communication and cooperation among agencies and residents of American Samoa, as well as the other sanctuaries, thereby leading to a common ground for decision-making. In a nutshell, the expected outcomes are: (1) less confusion about important data sets; (2) distribution of the data in such a way as to enhance the interpretation or conduct of SSE research; (3) increased contacts and opportunities for collaboration; (4) increased scientific understanding, particularly in key time series studies for habitat sustainability and coastal development policy-making.

Framework data sets will include (filled bullets = existing data, open bullets = future possibilities):

- *In situ* temperature, salinity, and water quality data for habitat health (e.g., transmissivity and O₂) collected during the March 2000 expedition. Additional data may be incorporated from the University of Guam database where appropriate
- NOAA and NASA satellite imagery of sea surface temperature, turbidity, and chlorophyll a (especially to characterize any effects of the 1998-'99 El Niño on coral reef communities)
- 2-D and 3-D bathymetric maps
- bottom photography and sidescan sonar imagery (?)
- current species lists and locations of echinoderms and fish assemblages
- bibliographic database of peer-reviewed and "gray" literature pertinent to the Fagatele Bay National Marine Sanctuary, including pertinent references from educational and resource management groups and local, indigenous, ecological knowledge.
- trackline maps of initial dives, and subsequently ROV or *DeepWorker* tracks
- selected video from ROV or *DeepWorker* transects

- ❑ selected photographs of new species
- ❑ taxonomic identification of new species

It is anticipated that observations gathered with an ROV or *DeepWorker* will use census protocols from the Reef Environmental Education Foundation (<http://www.reef.org>) to establish baseline data for deep habitats in the sanctuary. The data will be used to characterize deep water habitats and assess long-term trends of fish assemblages, allowing scientists and managers to identify, characterize, and rectify human caused disturbance, should it occur [Akins, 1999].

Once a critical mass of data and information are available for the FBNMS, steps must be taken to ensure that they are never scattered in various formats and among several agencies, research institutes or universities. Tracking down desired data and metadata will be a daunting task for managers and scientists without a structured clearinghouse. For the general public the task will be even more difficult. Many data sets may be restricted to individual projects and then shelved, eliminating the potential for usefulness in a myriad of additional planning, management, and scientific projects. Managers, scientists, and the public may all express confusion over the complexity of identifying data at suitable scales, formats, and quality for designated management areas. Clearly then, there is a need to maintain an established clearinghouse, as well as a unified, policy-driven data framework **before** the quantity of data becomes somewhat overwhelming. Steps will include: (1) identify data sources and contact information; (2) establish an order of prioritization for data entry based both on availability and quality of the data; (3) integrate digital data into the GIS (ArcView and ArcInfo) using simple format filters and data input programs that have already been developed by *Wright et al.* [1997]; (4) compile metadata for all data layers; (5) upload to a web-based clearinghouse where users can view and query data and metadata online. All metadata will be created in compliance with the Federal Geographic Data Committee (FGDC) national standard. Protocols and maintenance procedures for data contributed to the clearinghouse will also be documented. A database framework document for future acquisitions will be created.

3.2 Objective (2): Analytical Procedures for Coral Reef Ecology

As data compilation for FBNMS grows it will be important to put it into the context of research questions that will guide management and protection protocols. For example [Tremblay, 1999].

- What are the mechanisms (currents, watershed size, bay geometry, tropical storm impact, sedimentation rates, and bathymetry) underlying observed patterns in community structure within this reef system?
- Do the patterns observed in community structure reflect history (is framework carbonate thickness predictable using present-day coral diversity, dominance and cover)?
- What are the implications for coral reef conservation and management?

This objective would explore a GIS approach to conducting a landscape ecology analysis for approaching some of these questions, which would have useful implications for the planning of future ROV, AUV or *DeepWorker* dives in SSE Phases One and Two and final analysis and interpretation in Phase Three. Further hypotheses may even be developed by local grade school or

high school students as part of an educational outreach on the island. *Bridgewater* [1993] notes that combining a landscape approach with a GIS is desirable because it allows study of the structure, function and change within coral reef systems while managing the many spatial and temporal scales. As a pilot study, a few physical factors important to coral reef development, along with several community descriptors (all subject to available data, primarily collected in March 2000) could be analyzed in the GIS via query, spatial correlation tests, and buffer analysis. *Treml* [1999] was successful with this approach in analyzing coral reef community ecology on St. John, U.S. Virgin Islands using factors such as current regime, substrate characteristics, coastal topography, bay geometry, watershed size, sedimentation, tropical storm impact, bathymetry, biodiversity, evenness biota distribution, and algae cover.

3.3 Objective (3): Information Space Modeling

Similar to many scientific and applied research fields, geography has moved from a data-poor to a data-rich and computation rich-environment [Miller and Han, 1999]. The scope, coverage and volume of digital geographic data sets are growing rapidly due to new high-resolution satellite systems, initiatives such as the National Spatial Data Infrastructure [*Buttenfield*, 1997], and data collection that is expanding from traditional vector and raster models to including georeferenced multimedia data [*Miller and Han*, 1999]. A paradox of the FBNMS is that it is currently and will probably continue to be for a few years, a relatively data-poor environment, owing primarily to its isolation. The investigator conducted a fairly comprehensive web search for geospatial data from American Samoa and was able to find only water level stations and geodetic control points from 1971. An interesting research question to explore as a second objective for the project is the feasibility of "information space modeling" as a means for faster, more efficient access of data and *information* for the sanctuary, to augment what will be collected in the field. For example, useful information could include ecological interpretations and protection protocols that have been established at similar sites in the Pacific that are trying to protect coral reefs. Information space modeling has arisen from the realization of a fundamental shift now taking place from a world that is based on the physical and material to one that is based on information (Figure 2). As such, the role of physical distance is changing as it is complemented by near instantaneous transactions in "cyberspace" that dramatically distort the effect of distance, thereby changing the traditional bonds which have led to the current geographical organization of regions [*Cairncross*, 1997]. Indeed *Batty and Harvey* [in press] maintain that there is an urgent need for a major initiative in the collection of network data and its subsequent analysis with respect to the search for new "information spaces", some of which may be useful for augmenting data-poor environments.

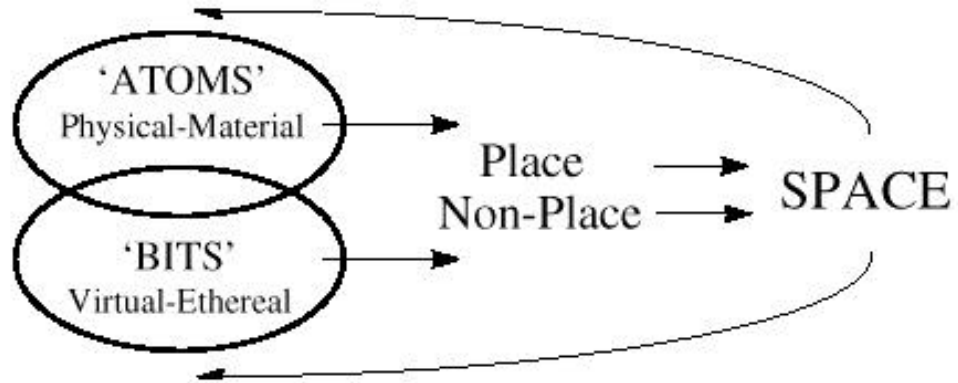


Figure 2. Cartoon of the geographic abstraction of physical, virtual and hybrid worlds after *Batty and Miller* [1999] and *Negroponte* [1995].

Construction of an information space model would include mapping out the locations of telecommunication networks, listing the pertinent contents of digital libraries as well as the policies and costs related to their operations, in essence constructing an "information delivery network" map for data being delivered to the National Marine Sanctuary System or other archives that could be useful to the FBNMS. Previous studies that could inform this work include the information delivery network map of *Murr et al.* [1995], of the Encyclopedia of World Problems and Human Potentials [*Union of International Associations*, 1991], the Internet diffusion maps of *Matrix in the World* [1995], and information space models of *Schroeder* [1997].

3.3 Additional Possibilities for a Baseline Mapping Objective

A research cruise in March 1999 led by Dr. Stan Hart of the Woods Hole Oceanographic Institution discovered and mapped a new, active submarine volcano east of Ta'u, American Samoa. His team will return in March 2000 to drop hydrophones near the volcano from the R/V Polar Star. Dr. Hart and I will be collaborating on a NSF proposal, to be submitted February 2001, that will return to the volcano to resurvey the summit crater and search for any associated hydrothermal vents and biota with the Autonomous Benthic Explorer (ABE), the Jason ROV, and the DSL-120 deep-towed sidescan sonar. A nighttime program for this cruise would be a complete survey of the FBNMS with ABE, as well as the submerged portions of the National Park of American Samoa. An AUV such as ABE is extremely desirable as a survey tool for such a small region (0.25 sq. mi.). Survey duration would be 1-2 days. In general AUVs are cheaper to operate than ROVs (\$5K to ship just a 20-foot van with vehicle and supplies halfway around the world), have enormous flexibility (fully autonomous or acoustically controlled, 6000 m depth range, CTD, beam and backscatter mapping, photography, etc.), and require only a small team to operate. If this NSF proposal is funded the survey would likely occur during the time of the investigators proposed POWRE activities and could be done in conjunction with setting up the GIS data and web serving machines at the FBNMS. Such a survey will not only greatly extend the SCUBA transect capabilities for examining and validating physical habitat maps of the bay but should also provide a better means of evaluating characteristics of the habitat such as seafloor roughness,

sediment and/or algal cover, reef size, vertical relief, etc. so that it may be determined what attracts and retains the destructive crown-of-thorn starfish, as well as fishes, sea turtles, and marine mammals. It should be possible to determine species abundance for many different fish and invertebrates in various sectors of the bay (to be determined by the initial survey in March 2000). In addition, bathymetric maps and habitat associations of these species will be used to expand the species abundances over the bay in order to get a total abundance for each species.

3.4 Milestone Chart for Completion of Objectives

identify data sources and contact information	██████████											
Prioritize data entry	██████											
GIS data integration & metadata creation	██████████											
Clearinghouse web site construction	██████											
Special session & results presented at AAG conference	██████											
Research and construction of pilot landscape ecology analysis	██████████											
Research and construction of pilot information space model	██████████											
Results & network at ESRI User Conference	██████											
Set up machine & possible field work at FBNMS	██████											
First draft of journal article	██████████											
Preliminary outline of new courses (period will be covered by another grant)	██████████										██████████	

Month	1	2	3	4	5	6	7	8	9	10	11	1
-------	---	---	---	---	---	---	---	---	---	----	----	---

4.0 Results of Prior NSF Support

“CAREER: Crustal Cracking Along Multi-Segment Portions of the Juan de Fuca Ridge and its Relation to Ridge Segmentation”

NSF Grant Number: OCE-9521039
Principal Investigator: **D.J. Wright**
Total Amount: \$79,958
Duration: September 1, 1995 - August 31, 1999

This project is supported under the NSF Faculty Early Career Development (CAREER) Program. It provides support over four years for a new Oregon State University (OSU) faculty member, Dr. Dawn Wright, to develop new, interdisciplinary courses in the geosciences, to promote scientific careers to undergraduate and high school students and graduate students (particularly students of color), and to carry out a two-pronged research program in different aspects of marine geophysics. The first part of the proposed research focused on a study of the geophysical development of the Tonga forearc, a region formed in response to ocean crust subduction and characterized by uplift of volcanoes and deep ocean crustal material west of the Tonga trench in the western Pacific Ocean. The fieldwork (Boomerang Leg 8 aboard the R/V Melville in May-June, 1996) was carried out successfully in collaboration with Dr. Sherman Bloomer, Chair of the OSU Department of Geosciences (as part of grant OCE-9521023, "Dynamics of Extensional Convergent Margins and the Origin of Supra-Subduction Zone Ophiolites: Hypothesis Testing in the Tonga Forearc; S.H. Bloomer and D.J. Wright, \$429,205).

The second focus was to be an investigation of crustal faulting and fissuring along the Juan de Fuca Ridge, a highly active ocean-spreading center located offshore western North America from northern California to Canada. Examination of the existing side-scan sonar data sets for this project revealed many artifacts and navigational errors, too numerous to undertake the study as planned. The data have also been since superceded by many surveys of portions of the ridge with newer, higher-quality AMS 60 sidescan data, which are still under the proprietary control of researchers at NOAA-PMEL in Newport, Oregon. As an approved substitute, Wright participated in a research cruise to the southern East Pacific Rise at 17-18° S and used DSL 120 sidescan sonar plus *Argo II* video data to attack the same fissure problem on the East Pacific Rise. This included the integration of the side-scan sonar and photographic data along the spreading axis to define the distribution and characteristic of cracks developed in response to the stresses involved in ocean crust formation. Understanding the distribution, length and shape of these cracks is improving our understanding of the mechanisms involved in sea floor spreading and expands on Dr. Wright's previous crack formation work on the northern East Pacific Rise at 9-10 N.

Aspects of both research programs have been integrated into new courses developed for graduate and undergraduate education at Oregon State University. **Publications supported by this grant are cited in Section D of the proposal.**

“A Scientific Information Management Schema for the Endeavour Portion of the Juan de Fuca Ridge Observatory”

NSF Grant Number: OCE-9633609
Principal Investigator: **D.J. Wright (OSU) and R.E. McDuff (U. Washington)**
Total Amount: \$180,279
Duration: May 15, 1997 - April 30, 1999

Funding was provided to integrate accurately-located, high-resolution topographic, photographic, seismic, chemical, geological, biological and acoustic data from the Endeavour Segment of the Juan de Fuca Ridge into a marine geographic information system (GIS) for support of the RIDGE Observatory Experiment (ROBE). In order to maximize the scientific return from these measurements, the system was implemented using an existing GIS architecture (ArcView). The GIS provides comprehensive data management, documentation, an interactive user interface, and data quality control for the multidisciplinary data from the Endeavour Segment. Comprehensive data management was achieved by properly integrating all existing data into the GIS and thoroughly documenting the effort. The project is an essential component of the RIDGE program for several reasons:

- It enables scientists to integrate several databases into a unique georeference system, where logical queries can be made and spatial relationships can be seen between various layers or themes of data.
- It provides a rapid, "unselfish," and logical way to disseminate knowledge to enable rapid response to such events as megaplumes or volcanic eruptions indicated by seismic events.
- It maximizes the scientific return on the millions of Federal dollars spent by NSF, NOAA and other agencies in collecting data from the Juan de Fuca Ridge.

Final results are being continually updated by R. McDuff and a UW student at <http://www2.ocean.washington.edu/gis>. This site is the heart of what the award was granted for. It allows the RIDGE community to access Endeavour data in various formats (text, GMT-style grids, and ArcInfo GIS coverages and grids which are also readable by the ArcView GIS). It also makes some public domain software tools available to aid in viewing and converting data. The site will eventually link to other sites maintained by data contributors.

The project provided part of a Master's thesis project for Hamilton Smillie in which he learned about the National Spatial Data Infrastructure and the Federal Geographic Data Committee content standard for geospatial metadata that was an integral part of the project. He researched the various tools used for the creation and management of metadata in relation to GIS and created a set of metadata documents for the Endeavour GIS. These skills led to a position as a metadata specialist/GIS analyst immediately upon his graduation, as the NOAA Coastal Services Center in Charleston, SC. **Publications supported by this grant are cited in Section D of the proposal.**

REFERENCES CITED

Results from Prior Support: OCE-9521039, References Cited

- Bloomer, S. and **D. Wright**, *Summary of Site Survey Cruise Results, Boomerang Leg 08. In Support of Proposal 451, Ocean Drilling in the Tonga Forearc: Subduction Geodynamics, Arc Evolution, and Deformation Processes at a Non-Accretionary Convergent Margin*. Ocean Drilling Program Site Survey Cruise Report, Department of Geosciences, Oregon State University, Corvallis, OR, 87 pp., 1996.
- Bloomer, S.H, **D.J. Wright**, and Boomerang Leg 8 Shipboard Scientific Party, Geology of the Tonga Forearc: A supra-subduction zone ophiolite, *Eos Trans. AGU*, 77(46), F325, 1996.
- Clift, P.D., C.J. MacLeod, D.J. Tappin, S.H. Bloomer, **D.J. Wright**, and Boomerang Leg 8 Shipboard Scientific Party, Forearc sedimentation, subduction erosion and the effect of seamount collisions in the Tonga Arc, *Eos Trans. AGU*, 77(46), F326, 1996.
- Clift, P.D., C.J. MacLeod, D.R. Tappin, **D.J. Wright**, and S.H. Bloomer, Tectonic controls on sedimentation in the Tonga Trench and Forearc, SW Pacific, *Geol Soc. Am. Bull.*, in press, 1998.
- Falloon, T.J., S.H. Bloomer, and A.J. Crawford, Boninites recovered from the Tonga forearc, *Eos Trans. AGU*, 78(46), F815, 1997.
- Kelman, M., S. Bloomer, and T. Falloon, Hydrothermal alteration of a forearc ophiolite, Tonga, Southwest, Pacific, *Eos Trans. AGU*, 78(46), F807, 1997.
- Sato, H., T. Ishii, S.H. Bloomer, **D.J. Wright**, and Boomerang Leg 8 Shipboard Scientific Party, Serpentinites from the Izu-Bonin-Mariana and Tonga Forearcs: Similarities and differences, *Eos Trans. AGU*, 77(46), F325, 1996.
- Wright, D.J.**, Formation and development of fissures at the East Pacific Rise: Implications for faulting and magmatism at mid-ocean ridges, in Buck, W.R., Delaney, P., and Karson, J.A. (Eds.), *Faulting and Magmatism at Mid-Ocean Ridges*, AGU Monograph, Washington, D.C: American Geophysical Union, 137-151, 1998.
- Wright, D.J.**, R. Wood, and B. Sylvander, ArcGMT: A suite of tools for conversion between Arc/INFO and Generic Mapping Tools (GMT), *Computers and Geosciences*, 24(8): 737-744.
- Wright, D.J.**, S.H. Bloomer, and Boomerang Leg 8 Shipboard Scientific Party, New Sea Beam 2000 bathymetry and sidescan data on the Tonga Forearc and Trench: Results from Boomerang Leg 8, an ODP site survey, *Eos Trans. AGU*, 77(46), F326, 1996.
- Wright, D.J.**, Semantic modelling for oceanographic data in Craglia, M.A and Onsrud, H. (Eds.), *Geographic Information Research: Trans-Atlantic Perspectives*, London: Taylor and Francis, 405-414, 1999.
- Wright, D.J.**, S.H. Bloomer, B. Taylor., A.M. Goodliffe, and C.J. MacLeod, Bathymetry of the Tonga Trench and Forearc, Marine Geophysical Researches, in press, 1999.
- Wright, D.J.**, R.M. Haymon, S.M. White, and K.C. Macdonald, Crustal fissuring on the crest of the southern East Pacific Rise, 17° 15'-40'S and 18° 23'-30'S: Further insights into volcanic-hydrothermal-tectonic cycles, *J. Geophys. Res.*, submitted, 1999.

Results from Prior Support: OCE-9633609, References Cited

Wright, D.J. and McDuff, R.E. , A geographic information system for the Endeavour Segment, *RIDGE Events*, 9(1):11-15, 1998.
<http://www2.ocean.washington.edu/gis>

Current Submission, References Cited

- Akins, L., Deep-water fish assemblage characterization of the National Marine Sanctuaries, Sustainable Seas Mission Abstract, <http://www.sanctuaries.nos.noaa.gov/sse/investigations/projects/multiple/akins.html>, 1999.
- Batty, M., and H. Miller, Representing and visualizing physical, virtual and hybrid information spaces, in *Information, Places, and Cyberspace: Issues in Accessibility*, edited by D. Janelle, and D. Hodge, 14 pp., Springer-Verlag, Berlin, in press, 2000.
- Bridgewater P.B., Landscape ecology, geographic information systems and nature conservation, in R. Haines-Young, D.R. Green and S. Cousins (eds.), *Landscape Ecology and Geographic Information Systems*, London, Taylor and Francis, pp. 23-36, 1993.
- Dziewonski, A., and Y. Lancelot, Multidisciplinary Observatories on the Deep Seafloor, pp. 229, INSU/CNRS/IFREMER/USSAC/ODP, Marseilles, France, 1995.
- Killpack, D., Protected areas GIS: Bringing GIS to the desktops of the National Estuarine Research Reserves and Marine Sanctuaries, in *Proceedings of the 19th Annual ESRI User Conference*, Paper 198, <http://www.esri.com/library/userconf/proc99/proceed/papers/pap198/p198.htm>, Environmental Systems Research Institute, San Diego, California, 1999.
- Miller, H., and J. Han, Discovering geographic knowledge in data-rich environments, in *Specialist Meeting Report, Project Varenus*, 70 pp., National Center for Geographic Information and Analysis, Kirkland, Washington, 1999.
- Negroponte, N., *Being Digital*, A. A. Knopf, New York, 1995.
- Purdy, G.M., and G.J. Fryer, Proceedings of a Workshop on the Physical Properties of Volcanic Seafloor, pp. 279, Woods Hole Oceanographic Institution, Woods Hole, MA, 1990.
- Treml, E., Fringing reef framework development and maintenance of coral assemblages along St. John's south shore: A geographic information system (GIS) analysis, Master's thesis, University of Charleston, Charleston, South Carolina, 1999.
- Wilson, A.D., America's fragile sea sanctuaries-- Exploring and documenting, *Sea Technol.*, 39, 29-33, 1998.
- Wright, D.J., From Pattern to Process on the Deep Ocean Floor: A Geographic Information System Approach, Ph.D. thesis, University of California, Santa Barbara, 1994.
- Wright, D.J., Rumbblings on the ocean floor: GIS supports deep-sea research, *Geo Info Systems*, 6 (1), 22-29, 1996.
- Wright, D.J., Getting to the bottom of it: Tools, techniques, and discoveries of deep ocean geography, *Prof. Geog.*, 51 (3), 426-439, 1999a.

- Wright, D.J., A geospatial clearinghouse for the Oregon coast: Implications for improved hazard assessment, in *Abstracts of the Association of American Geographers 95th Annual Meeting*, pp. CD-ROM, Session 313, Association of American Geographers, Honolulu, Hawaii, 1999b.
- Wright, D.J., and M.F. Goodchild, Data from the deep: Implications for the GIS community, *Int. J. Geog. Inf. Sys.*, 11, 523-528, 1997.
- Wright, D.J., and D.J. Bartlett (eds.), *Marine and Coastal Geographical Information Systems*, 383 pp., Taylor & Francis, London, in press, 1999.
- Wright, D.J., R.M. Haymon, and D.J. Fornari, Crustal fissuring and its relationship to magmatic and hydrothermal processes on the East Pacific Rise crest (9°12'-54'N), *J. Geophys. Res.*, 100 (B4), 6097-6120, 1995a.
- Wright, D.J., R.M. Haymon, and K.C. Macdonald, Breaking new ground: Estimates of crack depth along the axial zone of the East Pacific Rise (9°12'-54'N), *Earth Planet. Sci. Lett.*, 134, 441-457, 1995b.
- Wright, D.J., C.G. Fox, and A.M. Bobbitt, A scientific information model for deepsea mapping and sampling, *Mar. Geod.*, 20 (4), 367-379, 1997.
- Wright, D.J., R. Wood, and B. Sylvander, ArcGMT: A suite of tools for conversion between Arc/INFO and Generic Mapping Tools (GMT), *Comp. Geosci.*, 24, 737-744, 1998.
- Wright, D.J., S.H. Bloomer, C.J. MacLeod, B. Taylor, and A.M. Goodliffe, Bathymetry of the Tonga Trench and forearc: A map series, *Mar. Geophys. Res.*, in press, 1999.
- Wright, D.J., R.M. Haymon, S.M. White, and K.C. Macdonald, Crustal fissuring on the crest of the southern East Pacific Rise, 17° 15'-40'S and 18° 23'-30'S: Further insights into volcanic-hydrothermal-tectonic cycles, *J. Geophys. Res.*, submitted, 1999.

Dawn Jeannine Wright

Associate Professor of Geosciences
Department of Geosciences, Oregon State University
dawn@dusk.geo.orst.edu
http://dusk.geo.orst.edu

Education:

- Ph.D, 1994, University of California, Santa Barbara, California
Individual Interdisciplinary Ph.D. in Geography and Marine Geology
- M.S., 1986, Texas A&M University, College Station, Texas
Oceanography
- B.S. , 1983, Wheaton College, Wheaton, Illinois
Geology (cum laude)

Professional Experience:

- Associate Professor, Oregon State University, 1999-present
- Assistant Professor, Oregon State University, 1995-1999
- Senior Researcher, Oregon State University, 1995
- Graduate Student Researcher, Marine Science Institute and National Center for Geographic Information and Analysis, Santa Barbara 1990-1994
- Marine Laboratory Specialist, Logistics and Technical Support, Ocean Drilling, Texas A&M, 1986-1989
- Graduate Research Assistant, Science Operations, Ocean Drilling, Texas A&M, 1985-1986
- 18 research cruises aboard the *D/V JOIDES Resolution*, *R/V Melville*, *R/V Atlantis II*, and *R/V Gyre*, 1984-1996

Recent Research Accomplishments:

Wright is a leader in GIS research, instruction, advising and service on the Oregon State campus. In 1991 she was one of the first North American scientists to successfully apply GIS to deep ocean geology and has since been involved in a variety of mapping and analytical studies of the marine environment using GIS and experimental user interfaces, culminating in the publication of the first book on the subject ("Marine and Coastal Geographical Information systems", Taylor & Francis, due out in October 1999.) In 1995 she created a scientific information model for marine data from the NE Pacific for NOAA and was involved in the development of NOAA's first large-scale marine GIS to be served over the web. Based on the success of this effort Wright was funded by the National Science Foundation (NSF) to create a marine GIS and FGDC-compliant metadata catalog for the Endeavour segment of the Juan de Fuca Ridge, NE Pacific. She has recently been honored by the National Center for Geographic Information and analysis (NCGIA) and the RIDGE program of the NSF as one of the nation's promising young scholars in geographic information science and marine geology.

Wright currently serves as chair of communications, member of the national education committee, and lead Oregon State delegate for the University Consortium for Geographic Information Science (UCGIS), as well on the program committee for the Driven by Data Symposium of the Consortium for Geographic Information, and the Affirmative Action committee of the Association of American Geographers.

Professional Recognition:

- Outstanding Professor, University Honors College, Oregon State University, 1999
- Women of the Year in Education, *Clarity Magazine*, a Guideposts publication for women
- Excellence in Mentoring, College of Oceanic and Atmospheric Sciences, Oregon State University, 1998
- U.S. Fellow, RIDGE/Nordic Volcanological Institute Summer School on Active Processes at Mid-Ocean Ridges, Lake Myvatn, ICELAND, 1997
- U.S. Fellow, International Young Scholar's Summer Institute in Geographic Information, (sponsored by the European Science Foundation GISDATA program and the National Science Foundation National Center for Geographic Information & Analysis, Berlin, GERMANY, 1996

Faculty Early Career Development Award (*formerly the Presidential Young Investigator Award*, National Science Foundation, 1995)
 Ford Foundation Dissertation Fellowship, National Research Council, 1993-1994
 University of California President's Fellowship, 1990-1993
 Program committee, Consortium of Geographic Information Driven by Data conference series (formerly GIS/LIS)
 Chair, Communications Committee, University Consortium for Geographic Information Science
 National Education Committee of the University Consortium for Geographic Information Science
 AGU Information Technology Committee
 Presentation team for the UCGIS briefing of members and staffers of the U.S. House of Representatives and U.S. Senate, Capitol Hill, Washington, D.C., January 29th
 Leader of the Emerging Technologies Working Group, National Education Committee of the UCGIS
 International Programme Committee of the GIS Planet '98 International conference and Exhibition on Geographic Information, Lisbon, Portugal

Five Relevant Publications:

1. Wright, D.J. and D.J. Bartlett (eds.), in press, 1999. *Marine and Coastal Geographical Information Systems*, London, Taylor & Francis, 348 pp.
2. Wright, D.J., R. Wood, and B. Sylvander. 1998. ArcGMT: A suite of tools for conversion between Arc/INFO and Generic Mapping Tools (GMT), *Comp. Geosci.*, 24 (8), 737-744.
3. Wright, D.J., and M.F. Goodchild. 1997. Data from the deep: Implications for the GIS community, *Int. J. Geographical Information Science*, 11(6),523-528.
4. Wright, D.J., C.G. Fox, and A.M. Bobbitt. 1997. A scientific information model for deepsea mapping and sampling, *Marine Geodesy*, 20(4): 367-379.
5. Wright, D.J., S.H. Bloomer, C.J. MacLeod, B. Taylor, and A. Goodliffe, in final review, 1999. Bathymetry of the Tonga Trench and Forearc: A Map Series, *Marine Geophys. Res.*

Selected Grants and Awards Within the Past 5 Years:

1. \$21,193, "Integration of Historical Groundfish Habitat Data With New High Resolution Remote Sensing Data on Heceta Bank" Oregon Sea Grant, 1999, co-PI (with M. Hixon and B. Embley)
2. \$40,000, "A National Geospatial Clearinghouse for the Oregon Coast," Federal Geographic Data Committee, 1998-1999, co-PI (with G. McMurray, J. Guyton, S. Barnett and P. Schoonmaker)
3. \$180,265, "A Scientific Information Management Schema for the Endeavour Portion of the Juan de Fuca Ridge Observatory," National Science Foundation, 1997-99, co-PI (with R. McDuff)
4. \$5,000, "NOAA VENTS Program Geographic Information System Metadata," National Oceanic and Atmospheric Administration, 1996, PI
5. \$79,958, "Crustal Cracking Along Multi-Segment Portions of the Juan de Fuca Ridge and its Relation to Ridge Segmentation," NSF, 1995-99, PI
6. \$429,205, "Dynamics of Extensional Convergent Margins and the Origin of Supra-Subduction Zone Ophiolites" Hypothesis Testing in the Tonga Forearc," NSF, 1995-99, co-PI (with S. Bloomer)

Recent Collaborators

Dr. Russ McDuff, School of Oceanography, University of Washington
 Dr. Sherman H. Bloomer, Dept. of Geosciences, OSU Dr. Cindy Lee Van Dover, William & Mary
 Dr. Michael F. Goodchild, Dept. of Geography, UCSB Dr. Rachel M. Haymon, Dept. of Geol. Sci., UCSB
 Dr. James D. Proctor, Dept. of Geography, UCSB Dr. Ken Macdonald, Dept. of Geol. Sci., UCSB

Graduate Students

7 Doctoral, 18 Master's, and 1 Honors undergraduate student advised and graduated. Currently major adviser for Master's students, and serving additionally on 8 doctoral committees and 12 Master's committees.

Graduate and Postgraduate Advisors

Dr. Christopher G. Fox, NOAA-Pacific Marine Environmental Lab, Newport, OR (Postdoctoral supervisor)
 Dr. Raymond C. Smith, Dept. of Geography, UCSB (Doctoral Committee Chair)

NSF POWRE Proposal Submitted by Dawn J. Wright

Titled: New Collaborative Research with the Sustainable Seas Expeditions...

Proposed Project Dates: 12/16/2000 - 9/15/2001

	Fiscal Year 1 00/01	Fiscal Year 2 01/02	Cumulative	OSU C/S
A. SENIOR PERSONNEL				
Dawn J. Wright, P.I. 6 mos., .40 FTE/WSp	14,914		14,914	22,370
Dawn J. Wright, P.I. 2.5 mos., 1.0 FTE/Sum		16,157	16,157	0
Total Senior Personnel	14,914	16,157	31,071	22,370
Total Salary & Wages	14,914	16,157	31,071	
C. FRINGE BENEFITS				
Sr. Per. .33, .34	4,922	5,493	10,415	7,382
Total Salary & Benefits	19,836	21,650	41,486	29,752
E. TRAVEL				
1. Domestic - relocation costs to/from Corvallis	1,000	1,000	2,000	0
2. Domestic - attend AAG conf., New York City RT airfare, Per diem 5 days @ \$110/day, 5 day car rental	1,285	0	1,285	0
3. Domestic - attend ESRI conf., San Diego Per diem 5 days @ 110/day, personal auto	0	628	628	0
4. Foreign - Am. Samoa field work RT airfare LAX-Samoa-LAX, Per diem 5 days @ \$110/day	0	2,850	2,850	0
G. OTHER DIRECT COSTS				
1. Materials and Supplies* (inc. purchase of PC)	4,500	500	5,000	
2. Publication Costs	0	500	500	
Total Other Direct Costs	4,500	1,000	5,500	0
H. TOTAL DIRECT COSTS				
	26,621	27,128	53,749	29,752
I. INDIRECT COSTS RATES				
00/01 Yr. 1 26% Total Direct Costs	6,921	7,053	13,974	7,736
01/02 Yr. 2 26% Total Direct Costs				
Off - Campus Rate				
J. TOTAL DIRECT+INDIRECT				
	33,542	34,181	67,723	37,488
L. AMOUNT OF THIS REQUEST				
	33,542	34,181	67,723	37,488

Note: Cost Share is represented by the 60% sabbatical salary to be paid by OSU

BUDGET JUSTIFICATION

Salary

Six months of salary in FY 1 and 2.5 months of summer salary in FY 2 are requested by the P.I. to complete all aspects of the project. Please note that FY 1 salary is cost shared by Oregon State University, which paying is 60% sabbatical salary.

Benefits

Benefits for Wright have been calculated using Oregon State University-approved rates: 33% and 34%.

Travel

Funds are requested to:

1. relocate to and from Corvallis, OR during the 9-month sabbatical. Travel expenses have been calculated for 1 person using the following: Ryder Truck rental, Corvallis-Santa Barbara-Corvallis plus boxes, packing tape, and dolly at \$1000 each way for a total of \$2000.
2. attend the Association of American Geographers meeting in New York City to organize and present at a special session on marine sanctuaries and GIS, including results of the project as it progresses. Travel expenses have been calculated for 1 person using the following: round-trip airfare to New York @ \$400 **plus** conference registration of \$135, plus rental car @ \$200 for 5 days **plus** per diem at \$550 for 5 days for a total of \$1285.
3. attend the ESRI user conference in San Diego to present final results of the project and to network with SSE, NOAA, and National Geographic personnel. Travel expenses have been calculated for 1 person using the following: personal auto at \$78 roundtrip (Santa Barbara-San Diego-Santa Barbara) **plus** per diem at \$550 for 5 days for a total of \$628. The conference registration fee of \$850 will be waived due to OSU's site license contract with ESRI and hotel will be unnecessary.
4. travel to and from the Fagatele Bay National Marine Sanctuary in American Samoa to meet with personnel and local students, participate in field surveys, and implement final set up procedures for the marine GIS and web environment portion of the project. Travel expenses have been calculated for 1 person using the following: round-trip airfare to Pago Pago @ \$2000 **plus** excess baggage costs at \$300 **plus** 5 days' per diem at \$550 for a total of \$2850. The marine sanctuary staff will provide housing and transportation.

Other Direct Costs

Materials and Supplies

Included are costs for telephone and fax toll charges, photocopying, project supplies, and mailing costs for project-related materials. Funds are also included for the purchase of a Windows NT machine for design and construction of the marine GIS and web environment: Dell Dimension XPS T, 600 MHz, 384 Mb RAM, 27 Gb disk, 19" monitor, re-writable CD-ROM, and zip drive at ~\$3500. The P.I. already has the necessary software.

Publication Costs:

Page charges and funds for publishing one manuscript are requested, along with funds to cover the cost of reprints.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Dawn Wright	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Multi-level, 'Humane' Interfaces to Improve the Usability of the National Geospatial Data Clearinghouse	
Source of Support: UCGIS/Federal Geographic Data Committee (USGS) Total Award Amount: \$ 63,000 Total Award Period Covered: 12/15/99 - 12/15/00 Location of Project: Oregon State University Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Integrated Web Mapping - Serving and Integration of GIS Data from Distributed Sources on Distributed Map Servers	
Source of Support: NOAA Office of High Performance Computing & Communications Total Award Amount: \$ 67,500 Total Award Period Covered: 12/15/99 - 12/15/99 Location of Project: Oregon State University and NOAA-PMEL Seattle Person-Months Per Year Committed to the Project. Cal: 3.00 Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input checked="" type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Collaborative Research - Infrastructure for Coupling Data, Maps, and Models: The Virtual Research Vessel-1 (VRV-1)	
Source of Support: NSF-OCE Total Award Amount: \$ 478,747 Total Award Period Covered: 09/15/01 - 09/15/04 Location of Project: Oregon State University and University of Oregon Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 2.50	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:	
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title:	
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. Use additional pages if necessary.

Laboratory:

Map and light tables, computer graphics terminals, digitizing tablets, scanners and laser-quality post-script printers are available at the National Center for Geographic Information and Analysis, UC-Santa Barbara. Also, several high-end Unix workstation laboratories with geographic information system (GIS), image processing, and visualization software for teaching and research are available for the PI's use here Samoa (see letters of support under "Supplementary Documents").

Clinical:

Animal:

Computer:

One high-end Silicon Graphics workstations (O2) and a Power Macintosh, complete with ArcView and Arc/INFO GIS, web server, web authoring, and graphics software, are available from the OSU research lab of the PI, and she will be transferring these when she relocates to Santa Barbara.

Office:

Office space, telephones, fax machine, supplies, clerical support at the National Center for Geographic Information and Analysis, UC-Santa Barbara, and office space and computer usage at the Fagatele Bay National Marine Sanctuary, Am. Samoa (see letters of support under "Supplementary Documents").

Other:

Boat and SCUBA support at the Fagatele Bay National Marine Sanctuary, Am. Samoa for field studies; educational and media network to work with students and teachers at American Samoa Community College and local schools. Teleconference facilities to communicate with students in Hawaii for SSE student summits.

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate, identify the location and pertinent capabilities of each.

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual/subaward arrangements with other organizations.

FAGATELE BAY NATIONAL MARINE SANCTUARY

PO BOX 4318
PAGO PAGO, AMERICAN SAMOA 96799

phone: 011-684-633-7354
fax: 011-685-633-7355
email: Nancy.Daschbach@noaa.gov



American Samoa in partnership with NOAA

October 20, 1999

Regarding proposal *New Collaborative Research with the Sustainable Seas Expeditions at the Fagatele Bay National Marine Sanctuary* submitted by Dr. Dawn Wright, Oregon State University

I am writing in support of the proposal cited above developed by Dr. Dawn Wright. The Sustainable Seas Expedition is a five year mission beginning its second year, and March 2000 is presently scheduled for the initial expedition to American Samoa. We have several mission objectives for the coming year and at least two of them would be supported by Dr. Wright's proposals. We have a critical need for both detailed mapping of Fagatele Bay, and for the development of a comprehensive GIS database that links prior research and monitoring with present and future efforts.

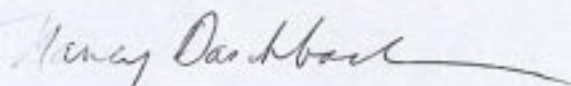
The Sustainable Seas Expedition is a high profile project with expectations to match. Here in American Samoa we plan to leverage the project to obtain information for which we have no other venue. We are a small office, with a staff dedicated primarily to educational goals. We have no capacity for research and currently conduct limited monitoring of the water quality and the coral reef health at Fagatele Bay. We would like to expand our database to feed into our larger programmatic goal of comprehensive habitat characterization which would include the components mentioned above of mapping and integrated database development. Until now, we have had to approach habitat characterization in a haphazard and piecemeal basis largely contingent upon serendipity—taking advantage of opportunities when they arise. We have not had the resource base to implement the type of research and monitoring program we want.

Dr. Wright's proposal can be supported in a number of ways in-kind. We have a boat and will be using other vessels if larger platforms are needed; she will have access to these vessels, although the SSE team will have first priority. We can provide scuba support. We have a strong education and media network both in Samoa, and regionally. Our ties to the American Samoa Community College and to local schools will allow us to involve local students in our SSE projects, and students will be encouraged to work with Dr. Wright. This year, we plan a student summit and hope to teleconference with students in Hawaii (one teleconference based in Hawaii during their mission, and one here during ours). Dr. Wright might be able to participate in future summits as a science advisor.

Although we will not be getting the submarines prominent in other SSE missions, we are proposing the use of an ROV which might be used for Dr. Wright's mapping objective. She is currently coordinating with the SSE plan team which will be developing the cruise plan in the next months. Her input may serve to direct the plan development for complimentary objectives. Wherever possible, we can offer her office space and computer use during her stay in Samoa

I feel that Dr. Wright's contribution to our SSE mission in American Samoa will play a vital role in the mission's success. If you need more information from me, please feel free to inquire.

Sincerely,

A handwritten signature in cursive script that reads "Nancy Daschbach". The signature is written in dark ink and has a long, sweeping horizontal line extending to the right.

Nancy Daschbach
Sanctuary Manager



735 State Street, Suite 305, Santa Barbara, CA 93101
Phone—805.963.3238 Fax—805.963.2438
Email—francesca.cava@noaa.gov

December 2, 1999

Dr. Dawn Wright
Associate Professor
Department of Geosciences
University of Oregon
Corvallis, Oregon 97331-5506

Dear Dr. Wright:

This letter is to express our support for your proposal to collaborate with the Sustainable Seas Expeditions (SSE) in support of our mission to the American Samoa Fagatele Bay National Marine Sanctuary. The main mission of SSE is to promote better understanding and protection of our national marine sanctuaries, many of which have little of the vital data needed to understand their current state of health, to monitor change over time or to provide for their continued protection.

Your research would be a valuable addition to our mission and one that is truly needed in this remote area. Although we do not have the office space to accommodate you while you will be completing the bulk of your project in Santa Barbara (for the period January-August, 2001), we will maintain close collaborative ties with you while you are housed at the National Center for Geographic Information and Analysis on the UC-Santa Barbara campus.

Thank you for your commitment to making the Expeditions a successful endeavor and for your part in continued research and protection of our oceans.

Sincerely,

A handwritten signature in black ink, appearing to read "F. Cava".

Francesca M. Cava

cc: Sylvia Earle

University of California

David Simonett Center for Spatial Analysis
Department of Geography, 3510 Phelps Hall
Santa Barbara CA 93106 4060
office (805) 893-8224
fax (805) 893-8617
ncgia@ncgia.ucsb.edu
Director: Keith C. Clarke

University at Buffalo

301 Wilkeson Quad
Box 610023
Buffalo NY 14261 0023
office (716) 645-2545
fax (716) 645-5957
ncgia@acsu.buffalo.edu
Director: David M. Mark

University of Maine

5711 Boardman Hall
Orono ME 04469-5711
office (207) 581-2149
fax (207) 581-2206
ncgia@spatial.maine.edu
Director: Max J. Egenhofer

November 30, 1999

Dawn Wright
Associate Professor
Department of Geosciences
Oregon State University
Corvallis, OR 97331-5506

Dear Dr. Wright,

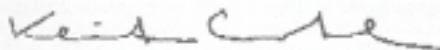
It is our pleasure to extend the following invitation to you. We invite you to be a guest of the National Center for Geographic Information and Analysis (NCGIA) at the University of California, Santa Barbara, for the period of January-August 2001. It is our understanding that you will be on sabbatical leave at this time and that your research will focus on the Fagatele Bay National Marine Sanctuary. Staying with us here at the NCGIA during this time will hopefully facilitate your research efforts--the Sustainable Seas Expeditions (SSE) is located here in Santa Barbara, and you have maintained excellent connections with the GIS and marine science communities at UCSB. Your research would indeed fit very well within the ongoing activities of the NCGIA and the Department of Geography.

Please be assured that we will reserve an office workspace (desk space) for you here within the NCGIA and will be able to set this up once you confirm the definite dates of your visit. You will be able to access our University library facilities and resources, as well as meet with our faculty, research staff, and students. It is our hope that you will provide a seminar or presentations to our various classes while you are here at UCSB.

If you have any questions re: these logistics, please contact my Executive Assistant, LaNell Lucius at (805) 893-8504, lanell@ncgia.ucsb.edu, fax (805) 893-8617. She will be most happy to assist in any way she can.

We are pleased at the prospect of your stay with us and look forward to working with you.

Sincerely,



Keith C. Clarke, Director
NCGIA Santa Barbara

cc: LaNell Lucius

Text of supporting document from NCGIA (original was sent to me as a fax and did not scan and convert to PDF very well)

November 30, 1999

Dawn Wright
Associate Professor
Department of Geosciences
Oregon State University
Corvallis, OR 97331-5506

Dear Dr. Wright,

It is our pleasure to extend the following invitation to you. We invite you to be a guest of the National Center for Geographic Information and Analysis (NCGIA) at the University of California, Santa Barbara, for the period of January-August 2001. It is our understanding that you will be on sabbatical leave at this time and that your research will focus on the Fagatele Bay National Marine Sanctuary. Staying with us here at the NCGIA during this time will hopefully facilitate your research efforts--the Sustainable Seas Expeditions (SSE) is located here in Santa Barbara, and you have maintained excellent connections with the GIS and marine science communities at UCSB. Your research would indeed fit very well within the ongoing activities of the NCGIA and the Department of Geography.

Please be assured that we will reserve an office workspace (desk space) for you here with the NCGIA and will be able to set this up once you confirm the definite dates of your visit. You will be able to access our University library facilities and resources, as well as meet with our faculty, research staff, and students. It is our hope that you will provide a seminar or presentations to our various classes while you are here at UCSB.

If you have any questions re: these logistics, please contact my Executive Assistant, LaNell Lucius at (805) 893-8504, lanell@ncgia.ucsb.edu, fax (805) 893-8617. She will be most happy to assist in any way she can.

We are pleased at the prospect of your stay with us and look forward to working with you.

Sincerely,

Keith C. Clarke, Director
NCGIA, Santa Barbara

cc: LaNell Lucius