

MARINE NOTES

How well do citizens understand the basic problems that have led to the decline of Chesapeake Bay, the actions that are currently being taken, and those that may have to be taken as we head into the next century?

The answers to these questions appear to be mixed.

Several years ago, a public attitudes survey sponsored by the Chesapeake Bay Program and the Alliance for the Chesapeake Bay revealed that citizens have “gotten” some messages, but missed others. For example, many of those questioned understood that the Chesapeake Bay is threatened by an overabundance of nutrients and chemical contaminants. But at the same time, a majority identified industry as a major cause of the Bay’s problems.

These views conflict with the widespread consensus among policy makers and scientists that the Bay’s major problems are due not primarily to the region’s smokestacks or discharge pipes, but to runoff from diffuse sources — runoff of nitrogen and phosphorus from agricultural and developed land such as suburban lawns and parking lots — as well as airborne pollution from automobiles and smokestacks that may be hundreds of miles away.

This consensus understanding has been broadcast widely and for some years — in newspapers, in newsletters, fact sheets, magazine articles, public television and, increasingly, on the Internet. In fact, the Bay region is awash in information designed for the average citizen — plain language explanations about nutrient overloading and related issues — that are coming from government and state agencies, environmental organizations, university laboratories and elsewhere.

SPOTLIGHT ON RESEARCH AND THE PUBLIC

Science and the Bay

BY MERRILL LEFFLER



Skip Brown

And yet, with all this information, there is a gap between what we have been learning from research for two decades and what a majority of citizens still believe to be the underlying causes of pollution. Closing the gap could well be critical to the success of the Bay restoration program — this is because controlling contaminants in the Chesapeake will, in the long run, depend on changes in individual, if not cultural, behavior.

Meanwhile, the business of the Chesapeake Bay Program continues, the keystone of which is reducing the

THERE IS A GAP BETWEEN WHAT WE HAVE BEEN LEARNING FROM RESEARCH AND WHAT A MAJORITY OF CITIZENS BELIEVE TO BE THE UNDERLYING CAUSES OF POLLUTION.

flow of nitrogen and phosphorus by 40 percent from 1985 levels. The governors of Maryland, Virginia and Pennsylvania, the Mayor of the District of Columbia and the U.S. Environmental Protection Agency have reaffirmed

this and other commitments to restore, and maintain, the health of the Chesapeake. These agreements have cost taxpayers many millions of dollars and will continue to cost millions for years to come.

The editors of *When Science Becomes Culture*, a recent book that

Please turn page

Science, continued

surveys citizen understanding of science and technology in countries throughout the world, claim that “science and its accomplishments demand that each person be able to participate in the debates on the future of our society, or at least understand their implications, in order to be a full-fledged citizen.” Is this so?

How important is it for all citizens to understand the scientific issues that influence public policy? Can the average person leave it to those who are more knowledgeable, to those experts who are already making decisions, namely, the resource managers, scientists, legislators, environmentalists and others who have a strong interest? Or if more people should be taking an active role, how can they be encouraged to do so?

A Public Appetite for Science

Almost since the beginning of modern science in the United States, scientists and their popularizers have engaged in promoting widespread understanding of scientific discoveries — from itinerant lecturers in the early 1800s who regaled their audiences on the wonders of science and technology to scientists such as Louis Agassiz later in the century. They spoke at public forums and wrote widely for the popular press — they were excited about the great advances that science and technology were making, and audiences had a large appetite for what these speakers had to say. Many believed that a scientific understanding of the world would not only lead to technical progress but social and moral progress as well.

If that ideal died in the trenches of World War I, public-minded scientists over these years — those who have made first-rate contributions to their fields — have continued speaking directly and enthusiastically to public audiences. Scientists such as Stephen Jay Gould, E.O. Wilson and the late Carl Sagan and Lewis Thomas are only a few among the most prominent.

Science and technology have continued to fascinate large public audiences. According to the National Science Foundation, which has been surveying public attitudes and public understanding of science and technology for the last 20 years, “public interest in new scientific discoveries rose from [a mean index score of] 61 in 1979 to 70 in 1997. While 70 percent of those questioned expressed a high level of interest in medical discoveries, more than 50 percent answered that they were “very interested in environmental issues.”

“SCIENTISTS HAVE TO TAKE RESPONSIBILITY THEMSELVES FOR EXPLAINING THEIR WORK TO THE PUBLIC — THEY NEED TO EXPLAIN IT IN PLAIN ENGLISH.”

These figures could be complemented by the volume of popular scientific enterprises: television programming (e.g., NOVA, National Geographic and Scientific American), special newspaper sections, non-fiction books, magazines, science and natural history museums, radio features. In this last half century, scientific communications has been a growth industry — from the journalists who cover science as their regular beat to scientific associations, universities and corporations that are producing more scientific information each day than can hardly be read, let alone digested, in several months.

Bruce Lewenstein in *When Science Becomes Culture* estimates that the federal government alone spends \$100 million which it identifies as public communication of science and technology. Adding in the resources of television, industries and other media producers, Lewenstein, a Professor of Communications at Cornell University, puts the total annual outlay in the billions.

And yet, with all the “translation” of science and apparent widespread public interest, surveys of public understanding have revealed what are, to many, discouraging findings. In

1995, for example, NSF commissioned a nationwide survey to assess the understanding that adults have of basic facts — among the questions: does the oxygen we breathe come from plants; how long does it take for the earth to orbit the sun; are electrons smaller than atoms? Of the 2,000 participating adults, a little more than 20 percent correctly answered seven or more of the ten questions. Less than half knew that it takes a year for the earth to orbit the sun.

As Senior Science Advisor to the President Neil Lane has pointed out, there is “a disconnect and discrepancy between the excitement about and the understanding of science.”

That there is an apparent “disconnect” is not new news. Ever since C.P. Snow published *The Two Cultures* in 1948, a book that sounded alarms on the gulf between

scientists and nonscientists, one crisis call after another has been rung pleading for radical improvement in scientific education, beginning in primary school, and for innovative techniques of communicating scientific information at all levels.

A Public Role for Scientists

In 1997, the First Amendment Center published what has become a widely-distributed report among academic scientists and research organizations, *Worlds Apart: How the Distance Between Science and Journalism Threatens America's Future*. Written by journalist Jim Hartz and physicist Rick Chappell, the report is the result of a roundtable meeting of scientists in 1996 and extensive surveys of scientists and journalists about the communication of science to the public.

One major conclusion of *Worlds Apart* is that most Americans don't understand the way science works because of the “inability of researchers to move from the jargon-filled laboratory into the ‘real’ world.” Some scientists are actively placing blame for the public's lack of understanding on themselves as well and are calling for active involvement by scientists in public education, not

Continued on page 4

Affecting Public Attitudes about the Environment

By MERRILL LEFFLER



Would more effective communication with the average person about environmental problems lead to improved understanding and therefore, behavioral change? The belief that it can has been a prevailing underpinning of environmental communications efforts, says James Grunig, Professor of Journalism at the University of Maryland. “Unfortunately,” he writes, “years of research on attitude change have not supported that deterministic assumption.”

“People are more likely to be motivated to think, evaluate, and act in situations that involve them, situations which they view as problematic, and in which they feel unconstrained,” Grunig says. In other words, people not only have to recognize there is a problem and that something needs to be done, but they have to feel that it has relevance to their own lives and that they can do something to change it.

Grunig has been conducting research on the relationship between communications and behavior for nearly 30 years, and has developed a “situational theory” that segments the public into multiple groups, or “publics.” His theory of communication behavior accounts for why people communicate and when they are most likely to communicate; when communications are likely to have an effect and “publics for which those effects occur most often.” Finally, Grunig writes, his research explains how individuals develop into activist groups that apply the pressure of *their* particular public.

In his situational theory, Grunig first defines citizen behavior as being either active — when people seek information; or passive — when people process information. It is situations,

situations that may often be instigated by media reporting, that help to create publics. He defines three types:

- Problem recognition: people feel that something should be done about a particular situation and think about what they might do.
- Constraint recognition: people feel that obstacles are in the way that limit their ability to do anything about the situation.
- Level of involvement: the extent to which people connect themselves with a situation.

As Grunig observes, “human beings simply do not have the time or the ability to be concerned about every problem in the world. They devote their time and energy to the problems that involve them and for which they can make a difference.” His theory shows that while people may process information about low involvement situations, they will rarely act on that information or actively seek more if the situation does not appear to involve them directly.

Making a Difference

If clear and persuasive information in itself is not likely to lead to widespread behavioral change, are there communication strategies that can make a difference? According to Grunig, communications programs need to first address those publics that are already active and that can make a difference. “Active publics are considerably more likely to engage in behaviors than passive publics,” Grunig writes, “and, therefore, more likely to use the information coming from a communications program as the basis for a behavior.”

Do these conclusions mean that there is little hope in reaching citizens who do not recognize that environmental problems such as those related to Chesapeake Bay concern them personally? Not necessarily. It means, according to Grunig’s findings, that the

challenge of creating publics lies in first using other means. “The answer to the challenge of creating publics out of non-publics lies not in the mass media but in creating publics by other means.” Scientists and others active in the Chesapeake Bay Program, for example, could play a key role here, by reaching out directly to community leaders and local organizations who more directly influence behaviors in their communities.

Education represents perhaps the best hope for influencing citizen behavior over the long term, education that begins in the elementary grades and continues through high school and beyond. A newly-released study of 40 schools in thirteen states, including Maryland — *Closing the Achievement Gap* — concludes that the environment itself is a powerful basis for learning at all grade levels. In using the environment as an integrative context for teaching language arts, math, science, social studies and thinking skills, schools have found improved student capabilities, from better performance on standardized measures of achievement to increased engagement in learning.

Finally, there are times when media coverage calls such attention to an issue that it can create what Grunig calls a “hot-issue public.” In such instances, a small public can grow into a larger one in which people now feel the issue affects them directly — they become, for a time at least, active seekers of information. Such times can become “teachable moments.” The *Pfiesteria* outbreak in the summer of 1997 is a case in point.

The intensive television and newspaper coverage of dying fish in the Pocomoke River, fish with ugly ulcerous lesions, raised a fury of questions throughout the Chesapeake Bay region. Just what is *Pfiesteria*? What are the causes? Why now? What are the toxins that *Pfiesteria* is said to release? Can I catch it? How close do I have

Please turn page

Attitudes, continued

to be? Is it safe to eat crabs and oysters and fish?

"The public's initial reaction was extreme and irrational," says Tim Wheeler of the *Baltimore Sun*, "but that was because people didn't understand what was happening and they didn't believe those who were giving assurances." And though he admits that excesses in the coverage added to public alarm, nevertheless, he says, "it did get people's attention." In such "crises," says Grunig, organizations need to be open and express candor, explaining what they know and what they don't. Numbers of organizations throughout the Bay tried to do just that, which led to citizen forums, scientific meetings, published reports such as the *Cambridge Consensus* on the potential relationship of *Pfiesteria* and nutrients, informative fact sheets, and a comprehensive web site.

The summer of 1998 passed with no reports of fish kills or human health effects due to *Pfiesteria* — while media interest naturally plummeted, it did not disappear. That is because meetings throughout the year brought scientists, managers and other now-active publics together for updates on the latest research and monitoring studies. The press has covered those meetings since the *Pfiesteria* story, though no longer a hot topic, is not yet cool either. This continuing interest — and the potential for further outbreaks of *Pfiesteria* in the future — may offer Chesapeake Bay organizations opportunities for reaching citizens in innovative ways.

One thing is clear from the *Pfiesteria* experience and from James Grunig's research: a stronger connection between technical experts and important "publics" that includes genuine two-way communication is the most promising way to involve today's citizenry in the vital work of restoring and protecting the environment. However, to sustain these efforts for the future, youth education — giving children direct experience with the Bay — may be the best hope to ensure that such work continues. ✓

Science, continued

only because of the intrinsic intellectual interest of science, but because such knowledge is of critical importance to society itself.

Recently, for example, twenty prominent ecologists nationwide signed a letter to *Science* magazine claiming, "ecologists have a responsibility to humanity, one that we are not yet discharging adequately." While they acknowledge that understanding the world through science satisfies "natural human curiosity," their concern is that scientists must take an active role in "solving the human predicament."

Until now, they write, "good science consisted of... doing first-rate research and publishing it in the technical literature for the benefit of scientific colleagues." This will no longer be good enough, they write: "[what] must now be added by all scientists is informing the general public (and, especially taxpayers) of the relevance and importance of our work."

Jane Lubchenco, Professor of Zoology at Oregon State University and signatory of the *Science* letter, goes even further: in her presidential address to the American Association for the Advancement of Science, she proposes a new "Social Contract" that calls on scientists to "communicate their knowledge and understanding widely in order to inform decisions of individuals and institutions."

University scientists in the Chesapeake Bay region have for years participated in policy forums, serving on committees and discussing the implications of their research. While the University of Maryland Center for Environmental Science has long had outreach programs in place that include advisory services, public information and environmental education, the Academy of

Natural Science Environmental Research Center has recently begun developing active public programming. Still, many scientists are resistant when it comes to direct contact with citizens and the media.

Long-time environmental reporter Tim Wheeler of the *Baltimore Sun* says that "scientists have to take responsibility themselves for explaining their work to the public — they need to explain it in plain English." Covering science is sometimes frustrating, Wheeler says. "Someone is doing interesting research but is

afraid to talk to the press because they've been burned in the past or think it's unseemly." Scientists, he says "have to come

down from the ivory tower and make more contact with the masses."

"There is a normal reticence scientists have in talking with the press," says Donald Boesch, president of the University of Maryland Center for Environmental Science. "It is based on a natural conservatism but also on the experience of being poorly quoted." Nevertheless, he adds, "Our [scientific] culture has undervalued the responsibility to communicate with the public." Research and its results are, after all, the goal — success, not failure, is what scientists depend on in writing new proposals that will maintain their research and support the infrastructure it takes to do so.

It will take cultural changes in our community, Boesch says, such as increasing the emphasis on "service to society" in the faculty promotion and reward process — one avenue for doing this is to stress the value of scholarly contributions in "synthesis" and "application."

The importance of the link between scientists and the media was underscored during the 1997 outbreak of the dinoflagellate *Pfiesteria piscicida* in the Chesapeake Bay: cov-

CITIZENS WHO UNDERSTAND THE SCIENTIFIC ISSUES, AND THE PROCESSES OF SCIENCE ITSELF, CAN MAKE MORE INFORMED DECISIONS ON PUBLIC ISSUES.

erage lit up like a firestorm, concentrating more fierce attention than any other event in the Bay. For weeks, major newspapers like the *Baltimore Sun* and *Washington Post* carried one or two stories a day; television led the evening news with the latest on *Pfiesteria*.

Boesch was a key spokesman on controversial issues related to the outbreak. As a scientist, he says, "I've come to see the incredible importance of communications through public media. "The media," Boesch adds, "informs decision makers. My experience is that elected officials are extremely responsive to the scientific information they hear and read in the public media." And, he says, "they are more likely motivated to operate on that [information]." This is added reason, he says, why scientists have a responsibility in making sure it is done well.

Science for the Next Century

Many have argued that the ongoing enterprise of science itself has a vested interest in scientists securing or promoting citizen understanding, a view reflected most recently in a House Science committee report that claims "the single most important challenge" facing science and technology is bolstering popular support for public financing. But another view equates public understanding with empowerment: citizens who understand the scientific issues, and the processes of science itself, can make more informed decisions on public issues — they can also take a more active role in determining just what those public issues should be.

After all, says journalist Jon Franklin, we cannot separate science from the mainstream of our life: "Science is pervasive in our civic life . . . in our lives generally." The winner of two Pulitzer Prizes for reporting on neuroscience at the *Baltimore Evening Sun*, Franklin sums up the challenge we face as we move into the twenty-first century: "if science was ever a thing apart, a special way of living and of seeing things, that time is past. Today, science is the vital principle of our civilization." ✓

In Memoriam: L. Eugene Cronin

Those in the research and environmental communities were saddened to hear of the death of University of Maryland Professor Emeritus L. Eugene Cronin at the age of 81 in December. Well-respected for his expertise and commitment to research and restoration of the Chesapeake Bay, the native Marylander began his career in 1943, when he became a biologist at the Chesapeake Biological Laboratory (CBL) in Solomons, at that time a state lab. During the early 1950s, he moved to the University of Delaware, where he established the marine laboratory in Lewes which subsequently became the College of Marine Studies.

Returning to CBL, he succeeded its founder Reginald Truitt as director, and oversaw its move into the University of Maryland, becoming the first director of the UM Natural Resources Institute; in that role he was directly responsible for establishing the Appa-

lachian Laboratory. In 1975, the Institute was merged into the newly created Center for Environmental and Estuarine Studies, serving as the Center's associate director for Research and later as director of the Chesapeake Research Consortium.

Cronin was one of the most influential scientists in the Chesapeake Bay region. He had major influence on environmental and fisheries policies in Maryland and in the creation of the Chesapeake Bay Program.

He remained active in retirement, participating in meetings and symposia such as one in November called "Across the Generations Dialogue" at which elder scientists talked with young researchers and students on the subject of science and the environment. Until a few days before his death, he was hard at work on a comprehensive book on the blue crab to be published by the Maryland Sea Grant College.

Tribute to a Beloved Researcher

Gene Cronin was a special friend to the Chesapeake Bay, to the scientific community that studies it, and to the University of Maryland, where he served for many years as director of Chesapeake Biological Laboratory and Associate Director of what is now the Center for Environmental Science. More recently, he became closely involved with Maryland Sea Grant when he and Vic Kennedy proposed that we publish a comprehensive book on the blue crab — we readily agreed to the proposal. Until the very end, Gene played an active editorial role; he was also instrumental in helping raise the funding necessary to see the project through to completion.

Just a few weeks before his passing, when I expressed concerns to him about his health, Gene told me most matter of factly that his heart was failing fast, and that he did not expect to be around much longer. He then quickly changed the subject to "the crab book," and what needed to be done next. This anecdote is a small reflection of the dedication Gene had for his life's work, a dedication that extended well beyond his formal retirement and far beyond any concerns he might have had about himself.

Right up until his death, Gene was absorbed by science, and in particular, by its relation to the Chesapeake Bay. He felt that good public policy could only stem from the proper application of excellent science. (He always seemed to use the word "excellent" when he talked about what science should be.) Gene's commitment to linking science and public policy made him an obvious choice to receive in 1994 the prestigious Mathias Medal jointly award by Maryland Sea Grant, Virginia Sea Grant and the Chesapeake Research Consortium. It was but one of the many honors that have been bestowed upon this great man, whose loss we feel profoundly.

— Chris D'Elia, Maryland Sea Grant College

Maryland Sea Grant Directorship Changes

Christopher F. D'Elia, director of the Maryland Sea Grant College since 1989, announced recently that he was leaving to become the Vice President for Research at the State University of New York at Albany. Jonathan Kramer was appointed Interim Director of the Maryland Sea Grant College as of January 1, 1999 by Donald N. Langenberg, Chancellor of the University System of Maryland.

D'Elia, also a tenured professor at the UMCES Chesapeake Biological Laboratory and well known for his work on nutrients and on coral reefs, played a key role in directing attention toward nitrogen as an important factor in the overenrichment of the Chesapeake Bay.



Christopher D'Elia

During his time with Sea Grant, D'Elia also served a national role in the joint federal-state program, serving as President of the Sea Grant Association, where he promoted a national initiative in marine biotechnology which resulted in legislation to fund a major research effort in that field. He was also instrumental in initiating a number of Sea Grant network-wide efforts, including the national media relations project, which promotes the strength of Sea Grant as a national repository of marine-related expertise.

In addition, D'Elia served as past president of the Estuarine Research Federation, chairman of the Board on Oceans and Atmospheres of the National Association of State Universities and Land-Grant Colleges, and is incoming chair of the Council of Scientific Society Presidents.

Jonathan Kramer, who brings a broad, interdisciplinary background that includes marine sciences, biological oceanography, microbiology and molecular biology, became Assistant Director for Research at Maryland Sea Grant in January of 1998.

He received his B.S. in Environmental Sciences in 1979 from the University of Massachusetts, his M.S. in Marine Environmental Sciences in 1982 from the State University of New York, Stony Brook, and his Ph.D. in Marine Estuarine Environmental Sciences from the University of Maryland, College Park, studying under the late Ian Morris who directed the University of Maryland Center for Environmental and Estuarine Science (now UMCES).



Jonathan Kramer

From 1993 to 1997 he held an appointment as a Research Assistant Professor at the Center of Marine Biotechnology, the University of Maryland Biotechnology Institute, in Baltimore.

His studies there centered chiefly on marine picoplankton in laboratory and field-based investigations to which he has applied modern molecular biological theories and approaches. "Jon is an exceptionally capable individual," says D'Elia. "His firm and steady direction will serve the program very well during this period of transition."

"We are very pleased to have someone of Jonathan Kramer's caliber to guide Maryland Sea Grant into a new era," said Donald N. Langenberg, Chancellor of the University System of Maryland. According to Langenberg, a nationwide search will begin soon for a permanent director.

Aquarium Program Features Blacks on the Bay

For Black History Month the National Aquarium in Baltimore is sponsoring a program entitled "Black Men, Blue Waters: African-Americans on the Chesapeake" that will highlight the important roles African-Americans played in the development of the Chesapeake Bay's seafood industry. A display of pictures and artifacts as well as educational materials about the Bay will run for the month of February; talks will be held on Friday evenings. Admission is \$5.00, which includes the exhibit and talks as well as a live dolphin show. For more information, call the Aquarium at (410) 576-3800.

February 5, 6:00 pm. Mrs. Azinith Williams, whose father founded the Black Seafood Workers Union, will discuss the lives of workers in seafood packing houses in Crisfield, Maryland. Lamont Harvey, a direct descendant of the only African-American family to own a packing house in St. Michael's, Maryland, will talk about oystermen and boat builders. The Northern Neck Chantey Singers, eleven retired watermen, will take to the stage, net in hand, and sing the folk music of the sea to the rhythm of their movements.

February 19, 7:30 pm. Vincent O. Leggett, project director of Blacks of

the Chesapeake, will give an oral and pictorial presentation entitled, "The Bay through Ebony Eyes." Earl White, a waterman for 60 years, will talk about his life working the water.

February 26, 7:30 pm. The National Association of Black Scuba Divers, an organization founded to promote scuba diving, water skills, awareness and conservation, will explain their connection to the *Henrietta Marie*, the only slave shipwreck in the western hemisphere identified by name. The 1983 excavation of the ship off the Florida Keys uncovered the largest collection of slave shackles found in one place.

Maryland Students Receive Knauss Fellowships

Tina Armstrong and Jennifer Merrill, two University System of Maryland students, both in doctoral programs in Marine-Estuarine-Environmental Sciences (MEES), are recipients of Knauss Marine Policy Fellowships for 1999.

The fellowship Program, begun in 1979 and coordinated by the National Oceanic and Atmospheric Administration's (NOAA) National Sea Grant Office, provides graduate students across the nation with an opportunity to spend a year working with policy and science experts in Washington, D.C.

Tina Armstrong will spend her fellowship year in NOAA's National Oceans Service in the National Center for Coastal Ocean Service (NCCOS), where she will contribute to efforts at predicting coastal ocean responses to natural and anthropogenic change.

Working with advisor Brian P. Bradley, Armstrong has focused her doctoral research on the use of protein expression signatures as a biomarker of anthropogenic stressors on aquatic organisms. She will complete her doctoral work in December at the University System of Maryland, Baltimore and will also receive an advanced certificate in Policy Science. She received her bachelor's degree in Biological Sciences, with a focus on Ecology, Evolution and Systematics, from Cornell University.

For her fellowship year, Jennifer Merrill will serve as a staff member in the office of U.S. Senator Carl Levin,



Pictured directly above, Tina Armstrong; pictured in next column, Jennifer Merrill.



who replaces Senator John Glenn as Democratic chair of the Great Lakes Task Force. The Task Force covers both the Senate and House and is a bipartisan subset of the Northeast-Midwest Coalition.

She received her B.S. in Environmental and Forest Biology from the State University of New York College of Environmental Science and Forestry in Syracuse in 1993. She enrolled in the MEES program the summer after graduating and was a student of Jeffrey Cornwell at the University of Maryland Center for Environmental Science (UMCES) Horn Point Laboratory where her research has focused on two water quality maintenance functions of tidal freshwater marshes, burial of particulate nutrients and denitrification. She will complete her degree at UMCES in May.

The process for selecting Knauss Fellows begins with the submission of applications by candidates recommended for their excellence by Sea Grant Directors across the nation. The National Sea Grant office then conducts a rigorous review process and awards fellowships to the top candidates. This year the Fellowship program received fifty-five nominations and presented thirty awards. Maryland was one of six programs with two fellowship awards.

Over the years, Knauss Fellows have gained experience in the legislative and executive branches of the federal government in locations such as the offices of U.S. Senators and Representatives, Congressional subcommittees and agencies such as the National Science Foundation and NOAA. Fellowships run from February 1 to January 31 and pay a stipend of \$30,000.

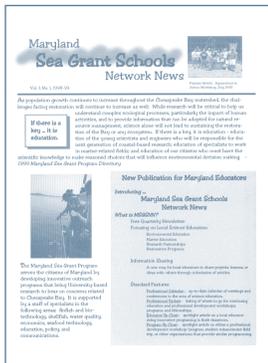
The application deadline for next year's Knauss Fellowship Program is September 8, 1999; however it is useful for those interested in applying to contact Maryland Sea Grant in early spring for guidance and possible volunteer project opportunities. For more information, visit the web at www.mdsg.umd.edu/NSGO/Knauss.html or request an application brochure from Susan Leet, Maryland Sea Grant College, phone (301) 405-6375.

MSG Request for Proposals

Maryland Sea Grant has released its 2000-2001 Request for Proposals to fund research aimed at improving the sustainable use of our marine and coastal resources, with a special emphasis on the Chesapeake Bay. Research proposals must demonstrate their applicability and use in solving real-world problems or in making the most of real-world opportunities. The RFP and examples of Sea Grant-funded research are available on the web and researchers can, for the first time, submit preproposals online at the site, <http://www.mdsg.umd.edu/MDSG/Research/RFP.html>. Since online submission will save paper and time, researchers are encouraged to use the web site; however those who would prefer to submit on paper can download a pdf file of the RFP booklet from the web which they can print out themselves, or they can request a paper copy and, using either version, type in the forms and submit in the traditional way. To request a booklet, call (301) 405-6371. Those who want more detailed information about Maryland Sea Grant's research program may request a copy of the most recent *Program Directory* (also on the web).

Preproposals are due in the Sea Grant Office no later than 5:00 p.m. March 12, 1999.

New Education Newsletter



Teachers in Maryland have a new venue for sharing marine-related education ideas. *Maryland Sea Grant Schools Network News* made its first appearance at the end of 1998 and will appear quarterly. The eight-page newsletter is edited by Maryland Sea Grant Education Specialist Adam Frederick and Regional Marine Specialist Jackie Takacs, with strong input from teachers. "We want to hear directly from teachers," says Frederick, himself a high school science teacher for many years before joining Sea Grant. He and his Sea Grant Extension colleague Jackie Takacs want to gather as many good ideas as they can find in the education community and see that they are shared with teachers

looking for activities, lesson plans, field trips and other educational experiences.

The premiere issue features a summer teacher workshop in aquaculture, where teachers get their hands dirty designing, building and fitting out recirculating tanks for teaching not only aquaculture, but also biology, physics, ecology, computer design and plumbing, among other things. The effort could not be more timely. The governors of Maryland, Virginia and Pennsylvania just signed an agreement with the Federal government, state legislators and the mayor of Washington, D.C. to stress Chesapeake Bay-related educational efforts throughout the region. The Sea Grant teacher network will help address the needs and creativity of teachers, to take advantage of programs already in place and to help spark new ones. For more information, contact Adam Frederick at the University of Maryland Center of Marine Biotechnology (frederic@mdsg.umd.edu) or Jackie Takacs at the University of Maryland Center for Environmental Science (takacs@cbl.umces.edu).

Maryland Marine Notes Volume 16, Number 6 November-December 1998

Maryland Marine Notes is published six times a year by the Maryland Sea Grant College for and about the marine research, education and outreach community around the state.

This newsletter is produced and funded by the Maryland Sea Grant College Program, which receives support from the National Oceanic and Atmospheric Administration. Managing Editor, Sandy Rodgers; Contributing Editors, Jack Greer and Merrill Leffler. Send items for the newsletter to:

Maryland Marine Notes
Maryland Sea Grant College
0112 Skinner Hall
University of Maryland
College Park, Maryland 20742
(301) 405-6376, fax (301) 314-9581
e-mail: mdsg@mbimail.umd.edu

For more information about Maryland Sea Grant, visit our web site:

www.mdsg.umd.edu/MDSG



***Maryland Marine Notes* (current and back issues since 1995) is also available on the web at www.mdsg.umd.edu/MDSG/Communications/MarineNotes**



Maryland Sea Grant College
0112 Skinner Hall
University of Maryland
College Park, Maryland 20742

Address Service Requested

Non-Profit Org.
U.S. Postage
PAID
Permit No. 10
College Park, MD