What is it that is not poison? All things are poison and nothing is without poison. It is the dose only that makes a thing not a poison.
Paracelsus (1493–1541)

MARINE SCIENCE

Stressed Reefs May Get Relief

Coral reefs, already one of the most delicate marine systems, are threatened by a host of pressures, including sea temperature increases, pollution, development, fishing, and tourism. Last March, the U.S. government unveiled an ambitious plan that addresses the most serious challenges facing coral reefs. Produced by the U.S. Coral Reef Task Force, the new National Action Plan to Conserve Coral Reefs, or NAP, is a collaboration of 11 U.S. agencies, 7 coastal states and territories, and private groups including conservationists and fishing interests.

"This is the first-ever long-term national blueprint to deal with the coral reef crisis," says Roger Griffis, a policy advisor with the National Oceanic and Atmospheric Administration who helped draft the NAP. "We need a comprehensive plan because we are at a critical juncture in our efforts to preserve coral reefs."

Under the NAP, 20% of all coral reefs would be set aside as "ecological reserves" where fishing and other extractive activities would be banned. The plan also calls for mapping U.S. coral reefs by 2009 to help decision makers prioritize their efforts; building an integrated national coral reef monitoring system that profiles and tracks the health of U.S. coral systems; and implementing an All-Islands Coral Reef Initiative to address the highest environmental priorities of U.S. state and territorial islands.

Two-thirds of the world's coral reefs may be dying and, if current conditions continue, 70% of them may be gone by 2050, according to statistics released by the U.S. Coral Reef Task Force. The report *Reefs at Risk: A Map-Based Indicator of Threats to the World's Coral Reefs*, issued by the World Resources Institute and several other environmental groups in 1998, concluded that 58% of the world's coral reefs are potentially threatened by human activities ranging from coastal development and destructive fishing practices to marine pollution and overexploitation of resources. Human land-based activities such as forestry, farming, and urban development produce pollution and sediment runoff that kill the reefs.

"Persuasive evidence shows that coral reef systems worldwide are subject to a host of natural and human-caused stresses and that these factors contributing to coral reef decline will continue unless we move to action," says Joanne Delaney, a research interpreter for the Florida Keys National Marine Sanctuary, which works to preserve and protect the Florida Keys' coral reefs.

Sunken treasure. Over 6,000 unique chemical compounds—possible weapons in the fight against diseases such as cancer—have been isolated from organisms that live in and around coral reefs.

Coral reefs provide food, jobs, storm protection, and other environmental services and environmental health protection for millions of people. About half a billion people live within 70 miles of a coral reef. "Coral reefs are more than coral; they are a myriad of interacting and interdependent organisms whose health is threatened by poor water quality and overfishing, and whose destruction threatens broader environmental and human health," says Jack Sobel, a scientist at the Center for Marine Conservation in Washington, D.C.

As human infections become increasingly resistant to existing antibiotics, scientists are studying coral reefs as a possible source for new cures for disease. Already, over 6,000 unique chemical compounds have been isolated from marine organisms that live in and around the coral. According to one estimate, about half of new cancer research focuses on marine organisms, and chemicals found within several reef-associated species—for example, dolastatin 10 and didemnin B—look promising as sources for new treatments for a variety of cancers. Coral is also being used for bone grafts, thanks to its great strength. "We are just beginning to understand the compounds and chemicals present in coral reef species and how these might benefit human health," says Delaney, who compares coral reefs to rainforests in their biological diversity.

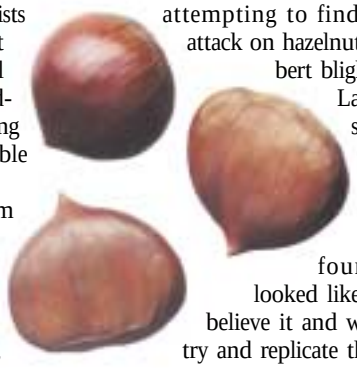
The environmental community generally welcomes the NAP as a bold and much-needed initiative. "One of the plan's strengths is that it takes an ecosystem approach to the coral reef issue," Delaney explains. "This is an important step toward better ocean governance, where the many jurisdictions involved focus on resolving issues and achieving common goals in coral reef environments."

But the big question is whether the money will be available to fund the NAP. As of August 2000, Congress was debating whether to provide funds in next year's budget for coral reef management. "The administration appears committed to the NAP, but if Congress withholds funding, the health of coral reefs may teeter in the balance. Even the best intentions will not save reefs by themselves," Sobel says. "Providing adequate funding would greatly strengthen the NAP and provide a chance for it to reach its laudable goals." **–Ron Chepesiuk**

PHARMACEUTICALS

Going Nuts over Paclitaxel

Extracting the lifesaving anticancer drug paclitaxel—better known by its brand name, Taxol—could cause less of an impact on the environment now that significant amounts of the drug have been found in the bark, leaves, limbs, shells, and fruit of the hazelnut tree. Even the fungi that are associated with the tree produce the drug. Although scientists caution that there is no proof that eating hazelnuts, or filberts, will provide anticancer effects, the finding offers great promise for providing an alternate source for this valuable drug.



Paclitaxel was first derived from the Pacific yew tree. Environmentalists have been concerned that cutting down enough trees to extract the drug, which is used to treat breast and ovarian cancer, might threaten the tree's existence.

Angela Hoffman, an associate professor of chemistry and physics at the University of Portland in Oregon—a state where hazelnut trees are grown in orchards—says certain varieties of the hazelnut tree produce as much as one-tenth of the paclitaxel found in the Pacific yew tree. Every gram of Pacific yew tree bark yields about 50–70 micrograms of paclitaxel; in branches and leaves of certain varieties of hazelnut, about 5 micrograms of paclitaxel can be extracted.

"It is relatively easy, chemically, to extract paclitaxel from the tree," Hoffman says. "It's quite difficult to synthesize the drug, which is why complete synthesis is not economically feasible." She says Bristol-Myers Squibb, the producer of Taxol, partially synthesizes the drug, using material from other yew varieties to produce the compound.

"We used exactly the same method for extracting paclitaxel from hazelnut as we used for extracting it from yew," Hoffman says. "Briefly, we grind the plant material with a coffee grinder, shake it for a while in methanol, centrifuge out the particles, evaporate the [methanol], extract the fat-soluble materials with hexane, and discard them. Then we remove the most water-soluble compounds. The remaining material contains paclitaxel and a lot of other compounds. These are separated using a reverse phase method."

In reporting the discovery of paclitaxel in hazelnut trees at the 219th national meeting of the American Chemical Society in San Francisco last March, Hoffman said, "This is potentially good news for cancer patients. If you find another source for the drug, you can lower costs."

A typical course of Taxol can cost $10,000–12,000, says Gary Strobel, a professor of plant sciences at Montana State University in Bozeman. "New uses for Taxol in treating cancer are being found every day," he says. "It has become the first billion-dollar-a-year anticancer medication."

The presence of paclitaxel in the hazelnut tree was discovered serendipitously when Hoffman and other Oregon researchers were attempting to find answers to a fungal attack on hazelnuts known as eastern filbert blight. In the process, says Laurence Daley, a professor of horticulture at Oregon State University in Corvallis who collaborated on that research, "we found something that looked like paclitaxel. We didn't believe it and we ran test after test to try and replicate the results." Their findings were published in the June 1998 issue of *Spectroscopy*.

Hoffman says she has found paclitaxel in more than 12 different varieties of hazelnut tree—although not in every variety—and in 8 species of fungus associated with hazelnuts. "We have been able to find paclitaxel in all parts of the tree that we have tested," she says. "The local farmers would very much like to [sell] their discarded tree parts, but so far there is no market for it. If and when such a market is created, I believe the currently discarded or burned tree limbs and shells could certainly become useful sources for paclitaxel." The researchers say that because paclitaxel may soon be produced by generic drug makers after Bristol-Myers Squibb's exclusive patent rights expire, hazelnut waste products may look even better, especially older growth, which tends to accumulate more paclitaxel. Daley also suggests that growing paclitaxel-producing fungi under laboratory conditions might allow for greater quantities of the drug to be produced at reduced costs.

Because the compound is found in two different species of trees that are very distant from each other, Daley suggests that other plants may also make paclitaxel. "Generally, these types of production pathways are not limited to one type of plant," he says. He adds that one important fact about the hazelnut trees is that they grow "like weeds" in contrast to the slow-growing Pacific yew.

"It's very humbling to know there is so much we don't know about the plant world," Daley says. "We certainly didn't expect to find

Ending the Chornobyl Threat

Just over 14 years after explosions damaged the Chornobyl nuclear power plant, the Ukrainian government announced on 5 June 2000 its decision to close the plant by 15 December 2000. During a visit to Ukraine coinciding with the announcement, President Clinton offered $78 million in U.S. assistance to rebuild the safety structure surrounding the plant's damaged reactor in order to reduce the continuing problem of radioactive dust.

Besides the funding announced by Clinton, the Department of Energy is pledging $2 million to help ensure the safe decommissioning of the plant and to upgrade safety measures at the four other nuclear power plants in Ukraine. U.S. agencies are also focusing on ways to mitigate the economic effects of the plant closure.

Ocean Protection in Motion

On 26 May 2000 President Clinton announced plans to protect Hawaii's coral reefs through an executive order that outlines the creation of a network of marine protected areas. The order calls for federal agencies to better manage the more than 1,000 marine areas already under protection and to establish new protected areas that fully represent the variety of ecosystems found along U.S. coasts. A new Marine Protected Area Center is to be established within NOAA in cooperation with the Department of the Interior to develop national guidelines for marine environmental research and prioritize protection needs for those areas.

The order also directs the U.S. EPA to strengthen Clean Water Act regulations for coastal and ocean waters to aid the review of proposals for activities that might result in pollution of these waters, and recommends the agency enact more stringent protection for unique and vulnerable areas.

Phasing Out Scotchgard

On 16 May 2000 3M announced it would voluntarily stop production of several of its well-known Scotchgard repellants and surfactants by the end of 2000. The decision stemmed from recent tests that found that perfluorooctanyl chemicals involved in their production can persist in the environment and human tissue for many years. Although current environmental concentrations of the chemicals are believed to pose no risk to human health, 3M official Charles Reich says the decision "anticipates increasing attention to the appropriate use and management of persistent materials." 3M takes in over $15 billion in annual sales.

In a 17 May 2000 Reuters news release, National Resources Defense Council scientist Linda Greer hails 3M's proactive position. Since chemicals related to the Scotchgard compounds cause a range of human and animal health problems, she says, "what you worry about is long-term buildup in tissues or organs to the point where it could

right under our noses in a field in Oregon. **–Ed Susman**

INTERNATIONAL

Russia Says *Nyet* to Environmental Agency

In a move that has sent shock waves through the Russian environmental movement, Russia's State Committee for Environmental Protection was abolished on 17 May 2000 by President Vladimir Putin. Putin announced that the duties of the former committee will be transferred to the Natural Resources Ministry (NRM), the agency responsible for licensing the development of the country's natural resources. The former committee was the sole agency responsible for carrying out environmental inspections and impact reviews as well as enforcing the country's environmental laws. Now these responsibilities lie in the hands of an agency that some fear may not have the best interests of the Russian environment at heart.

The NRM immediately announced plans to simplify Russian environmental legislation, for instance, by reducing the number of logging quotas in an effort to overhaul the policy's previous restrictions. In addition, on May 25, the Russian government announced the decision to construct 40 more advanced nuclear power reactors by the year 2030. Recently, Putin named Alexander Gavrin, who has close ties to the country's biggest oil producer, Lukoil, as the new energy minister.

Numerous petitioners, from members of the Russian Academy of Sciences to Patriarch Aleksy II of Moscow and All Russia, head of the Russian Orthodox Church, have asked Putin to reestablish an independent environmental agency. Russian activist Alexei Yablokov called the country's environmentalists together for a one-day conference a month after Putin's announcement to gather signatures for a nationwide referendum to restore the committee. According to an article in the 6 July 2000 *Moscow Times*, the participants of the conference signed an open letter to the citizens of Russia, asking them to demand a "complete change in the attitude of the governmental bodies towards the solution of environmental problems."

After Putin's election in March, the World Bank offered a $60 million dollar loan to Russia's forestry industry to help improve the investment climate for logging in Russia. In mid-July, 67 Russian scientists and activists asked the World Bank to suspend the funds until Putin reinstates the State Committee for Environmental Protection. World Bank vice president Johannes Linn agreed to not disburse the loan until the government clarifies its plans regarding reinstatement of the committee. After receiving a letter from the members of the Russian Academy of Sciences requesting restoration of the committee, Putin said he would think about it, and appointed the review of his decision to minister of natural resources Boris Yatskevich.

Commenting on Putin's restructured agencies in an Associated Press news release, Linn said, "The government's decision to reorganize those services can therefore be seen as an opportunity to improve natural resource management in Russia." But Yablokov, along with other prominent citizens, issued a statement on July 19 saying, "At this time the Ministry of Education is trying to exclude ecology from the secondary school program, [and] the Ministry of Internal Affairs forbids an environmental police in Moscow. . . . One must not improve the investment climate in

RECYCLING

No More Electronics Dumping in Massachusetts

Massachusetts has become the first state to ban the disposal of computer monitors, televisions, and arcade video games containing cathode ray tubes (CRTs) in public landfills or incinerators. As of 1 April 2000, the state revised its solid waste regulations to require residents to transport old electronics to designated centers or to recycle through curbside collection programs. The state is setting up six centers to collect the outdated machines.

Technology advances almost as fast as new products arrive on the market. The nonprofit National Safety Council, based in Itasca, Illinois, estimates that 20.6 million desktop computers became obsolete in 1998, and about a quarter were simply thrown away. These dumped electronics can pose environmental hazards. The average CRT (the leaded glass picture tube inside the monitor or television) contains 5–8 pounds of lead. Although the updated regulations focus on CRTs, Massachusetts environmental officials expect people to recycle their entire computers. Recycling the complete unit will eliminate further potential environmental hazards since a computer's circuit board may contain other metals besides lead, such as cadmium.

"It is a growing problem right now," said Jeremiah Baumann, an environmental advocate with the U.S. Public Interest Research Group in Washington, D.C., in a press release on 10 May 2000. "Computers are filled with all sorts of toxic chemicals—everything from a huge amount of lead in the monitors to mercury and cadmium in other parts of the computers themselves."

Massachusetts dumps an estimated 75,000 tons of electronics equipment each year. The state's Department of Environmental Protection estimates the amount of CRTs dumped will reach a high of up to 300,000 tons annually by 2005, especially as emerging technologies such as high-definition television and digital video disk players become standard. In 2006, federal law will require television broadcasts to switch from analog to digital transmission signals, making old television sets obsolete.

Some other states are also beginning to consider the problem of electronics dumping. In California, for example, residents of San Jose—the heart of Silicon Valley—are encouraged to dump their outdated hard drives, printers, and monitors into curbside recycling containers along with the usual plastic milk jugs and metal soup cans.

System failure. Throwing out old computers can mean dumping hazardous materials such as lead into the environment.

Old computer equipment collected in Massachusetts will either be refurbished and resold or broken down into recyclable parts. "We see more and more demand for recycling," said Steve Hess, co-owner of a company that buys, sells, and recycles used computers in Washington State, in an article in the 15 May 2000 *Seattle Post-Intelligencer*. "When we started six years ago we were recycling 20–50 computers a month. Now it's not uncommon for us to recycle 500 PCs in a month." **–Lindsey A. Greene**

National Integrated Pest Management Network

Integrated pest management (IPM) is an approach to crop protection that enhances environmental stewardship by using sustainable approaches to managing pests as an alternative to the automatic use of pesticides. IPM standards combine biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. By studying and understanding how difficult pest populations develop in addition to knowing how various control options affect the environment, a farmer can implement nonchemical controls as a first line of defense. After careful consideration, traditional pesticides and chemical control measures can then be chosen, timed, and applied when needed to prevent further loss.

The U.S. Department of Agriculture (USDA) is the principal agency involved with IPM research and education, and works to spread the word that new IPM practices are cost-effective and compatible with existing knowledge and resources but are not difficult to implement. The USDA's Cooperative State Research, Education, and Extension Service sponsors the Web site for the National IPM Network, found at http://www.reeusda.gov/agsys/nipmn/index.htm. This network is the result of a public–private partnership and is dedicated to making the latest and most accurate information on IPM available on the World Wide Web. Network members include universities, government agencies, and industries that have agreed to a set of Web design standards that ensure the consistent and trustworthy presentation of science-based, unbiased pest management information.

Located on the home page under the IPM Success Story heading are reports from various states that have implemented some form of alternative pest prevention. Also on the home page are links to regional network pages, listed under the Solutions heading. Each regional page is further organized by state, offering links to state government Web sites that can provide suggestions for solving local pest problems.

The site also includes various links to agricultural organizations such as the National Center for Agricultural Law Research and Information, the National Center for Food and Agriculture Policy, the Center for Tropical Pest Management, the Third World Academy of Sciences, and the World Bank, all accessible under the Other Ag Sites link. Also featured are press releases for agriculture news from around the world, found by following the Other Ag Sites link and searching the Agriculture Virtual Library. From the virtual library, clicking on Databases and Software, then Database of IPM Resources, leads to a compendium of worldwide IPM directories that offers a search engine for finding information on specific topics. By clicking on the Main Index link on this page, visitors can view case histories, current research, and resources divided into categories such as crop, control tactic, pest, and region.

For a quick introduction to IPM basics, visitors can click on the What Is IPM link on the home page to access an IPM primer. The primer offers an overview and outline of IPM definitions with a framework describing a sample general IPM program. There is also an electronic IPM textbook, which covers topics such as IPM definitions, methods, crop- and pest-specific programs, public policy, and pesticide issues. **–Lindsey A. Greene**

cause some problems."

Closing the Circle Awards

On 6 June 2000 the White House presented the annual Closing the Circle Awards, given out since 1995 to federal agencies and individual federal employees to recognize efforts in such areas as waste reduction, recycling, and facility design. The U.S. Postal Service received 3 of the 127 awards.

The first award was for the Postal Service's development of an environmentally friendly stamp adhesive and a process for producing stamps using 20% postconsumer-content paper.

Also recognized was the Corrales, New Mexico, post office, a facility constructed using straw bales as insulation, as well as other "green" building supplies such as recycled materials, wood from renewable sources, and energy-efficient lighting.

The third award went to the Greater South Carolina Postal Cluster for a CD-ROM it coproduced with the South Carolina Department of Health and Environmental Control called *Action for a Cleaner Tomorrow*. This CD, which contains student information on important environmental topics, has been distributed free of charge to the state's schools.

Taking Stock of Stockpiles

The General Accounting Office (GAO) released a report on 8 March 2000 outlining the findings of its investigation into the management of medical supplies being stockpiled for treatment of civilian victims of a biological or chemical terrorist attack. The GAO found that a lack of inventory controls resulted in several key items, including antidotes and antibiotics, being stored beyond their expiration date. The report also stated that the lack of controls led to inventory deficiencies and overages, with none of the agencies overseeing the stockpiles conducting periodic inventories to compare the stock with guidelines for required quantities. The GAO was also concerned about a lack of security and antifraud procedures at the stockpile sites.

The GAO recommended implementing unannounced inspections of the stockpiles and tracking systems to record transactions and assist in disposing of outdated supplies.

The Leydig Link

Researchers at the Population Council's Center for Biomedical Research in New York City have determined that HPTE, a metabolite of methoxychlor, causes declines in testosterone production and contributes to male infertility. Methoxychlor is a common pesticide in the DDT family whose use has increased since 1972, when DDT was banned in the United States.

In their study in the March 2000 issue of *Biology of Reproduction*, the researchers report that HPTE exposure mainly affects Leydig cells, which are the main producers of testosterone. The study findings also bolstered earlier reports that