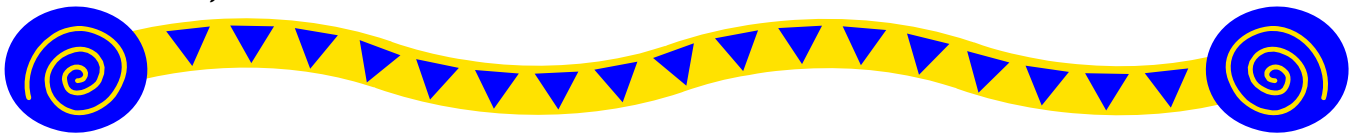


The Pearl Button Newsletter

Volume 7, Issue 1

Summer 2008



Cox's Commentary

By: Dr. Becky Cox, President

It is my privilege to be TEAMS President for the next two years. I am delighted to see new members mixed in with former ones! So..... what is this TEAMS Thing, anyway? Why does anyone want to be involved?

“The primary goal of the TEAMS organization is to provide opportunities for educators of all kinds to learn more about aquatic resources, experience first-hand opportunities that are available to educators and students in the field of environmental education, and network with other educators and resource professionals from formal and informal teaching backgrounds. All of this is done in an effort to improve the aquatic and marine education of our students and to promote the concepts of environmental stewardship to all.” Please visit our website at www.teamsoftn.org.

How are these goals met? Lots of hard work, networking, and FUN! A Spring Conference is held yearly, newsletters are received, emails pass furiously back and forth, and National Conferences are attended. Who benefits? Everyone! You grow as a person, a teacher, a mom or dad, husband or wife. Your students benefit as you teach them new strategies to learn science even better. Your peers become more capable as you share your new experiences. Perhaps your principal or supervisor notices the outstanding way you are doing your job. “Oh no,” you say. “It is summer, and I am tired of even thinking of school.” I agree completely! You must take care of yourself. Make time to do something just for you; you are worth it. Take a walk on the beach, kiss a baby, eat some ice cream, read a book. Regroup and recharge. As your summer continues, be good to yourself.

When it is time to get ready to go back to school and you need ideas for lessons, look to your TEAMS friends. When you run across a great activity, share it with your colleagues in TEAMS. Become involved and add your expertise to help make our organization even better!

TEAMS – Together Everyone Achieves More



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Minutes from Annual Board Meeting 04-27-08

By: Koren Livingston, Secretary

Meeting called to order after last session of Spring Professional Development Conference.

President's Report – Becky Cox

Expressed 'thanks' to the Tennessee Aquarium and everything they have done for TEAMS during this conference. Will follow up with an email/letter to Jennifer Latour and George Bartnik after conference.

The Beach Box, pre-TSTA workshop, went well and recruited several new members. Barry Farris, TSTA Treasurer, will be sending TEAMS a check in the amount of \$300.

Secretary's Report – Koren Livingston

Minutes from mid-year board meeting at TSTA passed with a change...winner of mini-grant to present how money was used at the annual TEAMS conference rather than at TSTA conference.

Treasurer's Report – Tom Young

\$4521.07 in the bank, we have paid out \$1724.70 during the conference.

The annual conference made \$4300 in registration fees and add-ons. The silent auction and bag auction made \$900. After all conference expenses have been paid we made a bit over \$3000 on the conference. Again, this would not have happened without the generosity of the Tennessee Aquarium. Courtney has a detailed conference report available to anyone interested.

Membership Report – Courtney Thompson

Our current TEAMS membership is 51 members. Will send out a renewal notice to those members that did not attend the conference.

Our first Lifetime Member is Padgett Kelly. Tom Young is also now a Lifetime Member. It was decided that the conference fee for Lifetime Members will be reduced as they do not have to pay their membership fee.

West Region Representative – Marcia Coleman

Not present – no report

Middle Region Representative – Peggy Vaughn

Nothing to report at this time

East Region Representative – Donna Tompkins

Working on recruiting volunteers for NMEA 2010.

Nominations/Newsletter – Courtney Thompson

Thank you to Kathy DeWein for serving as TEAMS President for the past 2 years, we look forward to Kathy's continued work in other capacities in TEAMS.

Congratulations to the newly elected TEAMS officers: Leeann Wampler, President-Elect; Tom Young, Treasurer; Koren Livingston, Secretary.

The voting procedure change increased participation in the voting process.



Photo By: Mary Margaret Ulderich

Kathy DeWein and
Becky Cox



If you do something please share so we can put it in the newsletter. Your story may encourage others.

Program Director – Fran Hamilton

We received a good review on conference evaluations.

Kathy – Can we list field trips on the registration form so we can have a count of participants? This year we had volunteers waiting to conduct a field trip and no one showed up.

Perhaps we can reduce the conference fee by having people pay for the field trip up front and make it non-refundable. People do change their minds when they arrive at the conference if they are not monetarily tied to a field trip.

Historian – Mary Margaret Ulderich

We need pictures from field trips, please email them to mmulderich@hotmail.com

NMEA Chapter Representative – Courtney Thompson

At NMEA 2008 – Savannah they are having a Chapter Basket competition. If you are going to Savannah please bring an item to donate to the basket. The Chapter that makes the most money will win a prize.

Aquatic Messaging for Sharon Walker – the Smithsonian's Ocean Hall is slated to open September 2008. As part of the exhibit they will have a messaging kiosk. Sharon Walker has asked each Chapter to develop 20 messages to contribute as she is still in need of approximately 250. Courtney to pass information along via email. Kathy mentioned a PBS Movie – 'Strange Day on Planet Earth' – can order on Amazon.

Old Business

- TSTA
Beach Box pre-TSTA workshop – do we want to do this again? Courtney and Fran agreed they could do it again but Fran would have to step out for about an hour to help with TEST workshop. We may want to change slightly to promote membership.
- TEST – Fran Hamilton – went to board meeting. In 2009 they are focusing on astronomy and 2010 they are focusing on oceans. TEST would like input from us on how to promote NMEA 2010.

New Business

- TEAMS 2009 – we need a theme and location by fall in order to promote at TSTA.
- April Qualls received the TEAMS \$100 mini-grant. She plans on using her mini-grant to teach students about penguins. She will present her results at next year's TEAMS conference.

Meeting adjourned...this meeting was followed by NMEA 2010 meeting.

Congratulations!

Kathy DeWein and Gale Stanley

**Recipients of the 2008 TEAMS
Outstanding Aquatic Educator Award.**

Lifetime Members!

**Dr. Padgett Kelly – 2008
Tom Young – 2008**



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Spring Professional Development Conference

By: Courtney Thompson, Newsletter Editor; Photos by Mary Margaret Ulderich

The TEAMS Professional Development Conference took place at the Tennessee Aquarium April 25 – 27, 2008. We want to once again thank the Tennessee Aquarium for their generosity in hosting us. On Friday evening the conference opened with a welcome from Tim Baker, Director of Education at the Tennessee Aquarium followed by a talk about outreach programs and research/conservation programs at the Tennessee Aquarium. The evening concluded with an Animal Spectacular where TEAMS members came face to face with many creatures used in programs at the Tennessee Aquarium. Thanks to all members of the Tennessee Aquarium staff, especially Bill Haley, Dr. Anna George, Susie Grant and Bray McDonald, who made this evening possible. It was enjoyed by all who attended.

Saturday morning got off to a busy start with concurrent sessions. Thank you to Dr. Becky Cox, Fran Hamilton, April Qualls, Koren Livingston, Ramona Nelson, Megan Ennes, Barbara Green, Dr. Diane Nelson, and Michelle Rogers who shared their expertise with us. Dr. Nelson truly exemplified the TEAMS spirit when she provided a last minute presentation due to an untimely cancellation. After lunch it was time for field trips. Many took time to enjoy the Aquarium on their own, others went to explore Rock City/Ruby Falls/ and Lookout Mountain, while others went on a stream study at Lula Lake. Stories about field trips were shared over a buffet dinner on the Aquarium plaza overlooking the river, what a fabulous atmosphere. The evening ended with the auction, IMAX film Sea Monsters and Sleep In the Deep in the Ocean Journey building.

The conference concluded with Dr. Diane Nelson's Keynote Address – Fun With Phosphate. After an overview of the Gray's Fossil Site at ETSU we searched for marine fossils from a phosphate mine in North Carolina. What fun! Dates for the 2009 Professional Development Conference will be announced soon and when they are be sure to mark your calendars.



Photo Left: Animal Spectacular



Photo Right: Coral Reefs Concurrent Session

Photos Below: Fun With Phosphate Session



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National Marine Educators Association Update

By: Courtney Thompson, NMEA Chapter Representative; Photos by Donna Tompkins

This year's NMEA Conference took place in Savannah, Georgia July 21 – 24, 2008. The conference theme was 'One World, One Ocean – United in Marine Education.' TEAMS was well represented at the conference with 15 members in attendance. It was an orange invasion as we all wore bright orange t-shirts to promote NMEA 2010 in Gatlinburg, Tennessee. The conference offered a wide variety of general and concurrent sessions as well as great networking opportunities. Two presentations that really stood out for me were the McIntosh County Shouters and Fabien Cousteau. For those that attended the conference you know how powerful the Shouters were and Fabien Cousteau provided such a unique perspective on the ocean as he has literally grown up in the water, wearing SCUBA gear at age 4. Mark your calendars now for NMEA 2009 – One World Conserving One Ocean. The conference will take place June 29 – July 3, 2009 at Asilomar Conference Grounds in Pacific Grove, California. Asilomar was the site of the very first conference hosted by NMEA in 1976.



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Conservation Corner

June 22, 2008

Sea of Trash

The New York Times

By DONOVAN HOHN

Off Gore Point, where tide rips collide, the rolling swells rear up and steepen into whitecaps. Quiet with concentration, Chris Pallister decelerates from 15 knots to 8, strains to peer through a windshield blurry with spray, tightens his grip on the wheel and, like a skier negotiating moguls, coaxes his home-built boat, the Opus — aptly named for a comic-strip penguin — through the chaos of waves. Our progress becomes a series of concussions punctuated by troughs of anxious calm. In this it resembles the rest of Pallister's life.

A 55-year-old lawyer with a monkish haircut, glasses that look difficult to break, an allergy of the eyes that makes him squint and a private law practice in Anchorage, Pallister spends most of his time directing a nonprofit group called the Gulf of Alaska Keeper, or GoAK (pronounced GO-ay-kay). According to its mission statement, GoAK's lofty purpose is to "protect, preserve, enhance and restore the ecological integrity, wilderness quality and productivity of Prince William Sound and the North Gulf Coast of Alaska." In practice, the group has, since Pallister and a few like-minded buddies founded it in 2005, done little else besides clean trash from beaches. All along Alaska's outer coast, Chris Pallister will tell you, there are shores strewn with marine debris, as man-made flotsam and jetsam is officially known. Most of that debris is plastic, and much of it crosses the Gulf of Alaska or even the Pacific Ocean to arrive there.

The tide of plastic isn't rising only on Alaskan shores. In 2004 two oceanographers from the British Antarctic Survey completed a study of plastic dispersal in the Atlantic that spanned both hemispheres. "Remote oceanic islands," the study showed, "may have similar levels of debris to those adjacent to heavily industrialized coasts." Even on the shores of Spitsbergen Island in the Arctic, the survey found on average a plastic item every five meters.

Back in the 1980s, the specter of fouled beaches was a recurring collective nightmare. The Jersey Shore was awash in used syringes. New York's garbage barge wandered the seas. On the approach to Kennedy Airport, the protagonist of "Paradise," a late Donald Barthelme novel, looked out his airplane window and saw "a hundred miles of garbage in the water, from the air white floating scruff." We tend to tire of new variations on the apocalypse, however, the same way we tire of celebrities and pop songs. Eventually all those syringes, no longer delivering a jolt of guilt or dread, receded from the national consciousness. Who could worry about seabirds garotted by six-pack rings when Alaska's shores were awash in Exxon's crude? Who could worry about turtles tangled in derelict fishing nets when the ice caps were melting and the terrorists were coming?

Then, too, for a while it seemed as if we might succeed in laying this particular ecological nightmare to rest. In the mid-1980s, New York's sanitation department began deploying vessels called TrashCats to Hoover up scruff from the waterways around the Fresh Kills landfill. Elsewhere beach-sweeping machines did the same for the sand. In 1987 the federal government ratified Marpol Annex V, an international treaty that made it illegal to throw nonbiodegradable trash — that is, plastic — overboard from ships in the waters of signatory countries. The good news for the ocean kept coming: in 1988, Congress passed the Ocean Dumping Reform Act, which forbade cities to decant their untreated sewage into the sea. In 1989 the Ocean Conservancy staged its first annual International Coastal Cleanup (I.C.C.), which has since grown into the largest such event in the world. But beautification can be deceiving. Although many American beaches — especially those that generate tourism revenues — are much cleaner these days than they used to be, the oceans, it seems, are another matter.

Not even oceanographers can tell us exactly how much floating scruff is out there; oceanographic research is simply too expensive and the ocean too varied and vast. In 2002, Nature magazine reported that during the 1990s, debris in the waters near Britain doubled; in the Southern Ocean encircling Antarctica the increase was a hundredfold. And depending on where they sample, oceanographers have found that between 60 and 95 percent of today's marine debris is made of plastic.



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Plastic gets into the ocean when people throw it from ships or leave it in the path of an incoming tide, but also when rivers carry it there, or when sewage systems and storm drains overflow. Despite the Ocean Dumping Reform Act, the U.S. still releases more than 850 billion gallons of untreated sewage and storm runoff every year, according to a 2004 E.P.A. report. Comb the Manhattan waterfront and you will find, along with the usual windrows of cups, bottles and plastic bags, what the E.P.A. calls “floatables,” those “visible buoyant or semibuoyant solids” that people flush into the waste stream like cotton swabs, condoms, tampon applicators and dental floss.

The Encyclopedia of Coastal Processes, about as somniferously clinical a scientific source on the subject as one can find, predicts that plastic pollution “will incrementally increase through the 21st century,” because “the problems created are chronic and potentially global, rather than acute and local or regional as many would contemplate.” The problems are chronic because, unlike the marine debris of centuries past, commercial plastics do not biodegrade in seawater. Instead, they persist, accumulating over time, much as certain emissions accumulate in the atmosphere. The problems are global because the sources of plastic pollution are far-flung but also because, like emissions riding the winds, pollutants at sea can travel.

And so, year after year, equipped with garbage bags and good intentions, the volunteers in the International Coastal Cleanup fan out, and year after year, in many places the tonnage of debris is greater than before. Seba Sheavly, a marine-debris researcher who ran the I.C.C. until 2005, says the Ocean Conservancy’s cleanup “has never been about curing the problem of marine debris.” It has always been, she told me, “a public awareness campaign.” Now a private consultant to the plastics industry and the United Nations Environment Program, among other clients, Sheavly says she believes that the primary value of coastal cleanups lies in the lesson they teach volunteers — “that what they’re picking up comes from them.” On Alaska’s outer coast, however, only a fraction of the debris washing in comes from local litterbugs. On much of Alaska’s 33,000-mile shoreline, in fact, there are no local litterbugs. On much of Alaska’s shoreline there are no people at all.

When Pallister took me there last July, a GoAK crew had been at work for two weeks cleaning up Gore Point (population: 0), part of a 400,000-acre maritime wilderness at the heart of the Kenai Fjords. Despite the pretty scenery, few nature lovers bother to visit. You can travel to Gore Point only by helicopter, seaplane or boat, and then only when weather permits, which it often does not. In the lower 48, beach cleanups tend to involve schoolchildren gleaning food wrappers and cigarette butts left by recreational beachgoers. GoAK’s cleanups, by contrast, are costly expeditions into the wild. The group’s volunteers must be 18 or older, and all must sign a frightening waiver in which they agree not to hold the organization liable for perils like “dangerous storms; hypothermia; sun or heat exposure; drowning; vehicle transportation and transfer; rocky, slippery and dangerous shorelines; tool and trash related injuries; bears; and” — in case that list left anything out — “other unforeseen events.”

The windward shore of Gore Point is what’s known among beachcombers and oceanographers as “a collector beach.” In 1989, according to The Anchorage Daily News, more of Exxon’s spilled oil ended up there than on any other beach on Alaska’s outer coast, but unlike the oil, the incoming debris never ended. Every tide brings more. Over the course of several decades, ever since the dawn of the plastics era, a kind of postmodern midden heap accumulated behind the driftwood berm. To beachcombers in the know, Gore Point was a happy hunting ground, one of the best places in Alaska to find exotic oddities. To Pallister, it was a paradise lost. Now, subsidized by a \$115,000 matching grant from the National Oceanic and Atmospheric Administration (N.O.A.A.), he had embarked upon a possibly quixotic mission to regain it.

Pallister refuses to accept that beach cleanups are merely public awareness campaigns. And so, it seems, does the federal government. In 2006, in part thanks to lobbying by the Ocean Conservancy, Congress passed the Marine Debris Research, Prevention and Reduction Act. Last winter, Pallister applied for one of the grants authorized by the bill. By then GoAK certainly had acquired the requisite expertise. Before founding GoAK, Pallister and his field manager, Ted Raynor, helped organize an annual volunteer beach cleanup in Prince William Sound. Over the course of four summers, working their way eastward from Whittier, the volunteers scoured approximately 70 miles of rugged shoreline. At that rate, Pallister and Raynor calculated, it would take 200 years to clean Prince William Sound just once. Rather than abandon all hope — perhaps the most rational response — they chartered GoAK and started raising money.

In its first summer in action, GoAK managed to clean 350 miles of rugged shoreline, picking up enough trash to fill 46 trash-hauling bins. Pallister wasn’t satisfied. It wasn’t enough to clean beaches near coastal communities.



And so, last summer, Gore Point became a front line in the federal government's campaign against debris. What would it take, Pallister hoped to learn, to clean up one wild beach?

To me, Gore Point seemed like the scene of an unsolved environmental mystery — unsolved and possibly unsolvable. Who, if anyone, can be held accountable for all that plastic trash? What, if anything, does it forebode for us and for the sea?

By the time we reach GoAK's base camp on Gore Point's leeward shore, Alaska's long midsummer twilight has begun. Pallister is anxious to have a look at the cleanup site before dinner. Raynor leads the way, his brindled pit bull Bryn racing ahead, sniffing the ground for marmots and bears. The narrow trail dips and meanders eastward across an isthmus, following the edge of a meadow where wildflowers are in bloom before veering into the forest, the floor of which is overgrown with devil's club, an aptly named shrub whose thorns, Pallister warns me, can be fiendishly difficult to get out. In the distance, trash bags, some yellow, others white, flash between the spruce trunks. By Raynor's estimate, in the last two weeks, he and nine other workers — the crew manager Doug Leiser, Leiser's two sons, Pallister's three sons and three volunteers from Homer — filled around 1,200 garbage bags weighing, on average, 50 pounds each. That's 60,000 pounds, or 30 tons, of debris. All along the length of the beach, a dozen yards apart, are heaps of bags, great colorful cairns, and here and there, clustered in the grass, are loose objects too big or heavy for bags — the wheel of a car, a microwave oven, a television screen that, shorn of its cabinet, looks naked, like a brain without a skull.

There's one acre of forest left to be cleaned up. As we approach, the mossy earth begins to crackle and crunch underfoot. I recognize the sound: we're walking over buried plastic. Behind the moldering trunk of a fallen spruce, a deep drift of trash has collected, like water behind a dam. This is what the entire shore looked like two weeks ago, Raynor says. Gill-net floats appear to be the most abundant item, polyethylene water bottles the second-most abundant. Many of the floats and nearly all of the bottles are inscribed with Asian characters. I unearth a flip-flop, and then, a few moments later, an empty container of Downy, the fabric softener. Pallister has a theory about where all this trash comes from. "There's a weather phenomenon we have here," he told me in Anchorage. "A winter low sets this prevailing wind pattern that will just funnel this way for days on end if not weeks on end. That wind is blowing right across that bunch of plastic out there." The "bunch of plastic" he was talking about is the flotilla of trash, purportedly at least as big as Texas, that has accumulated at the becalmed heart of the North Pacific Subtropical Gyre, a giant clockwise circuit of currents that revolves between East Asia and North America.

High-pressure systems like the one that predominates over the North Pacific Subtropical Gyre force currents to spiral inward. Oceanographers call these spirals "convergence zones." Low atmospheric pressure systems like the one that predominates over the Gulf of Alaska have the opposite effect, creating "divergence zones" where the surface currents move outward toward shore. Divergence zones tend to expel debris. Convergence zones collect it.

In 2001 a peer-reviewed scientific journal called *The Marine Pollution Bulletin* published a study, whose undramatic title, "A Comparison of Plastic and Plankton in the North Pacific Central Gyre," belied its dramatic findings. The lead author — a sailor, environmentalist, organic farmer, self-trained oceanographer and onetime furniture repairman named Charles Moore — went trawling in the North Pacific convergence zone about 800 miles west of San Francisco and found seven times as much plastic per square kilometer as any previous study. "As I gazed from the deck at the surface of what ought to have been a pristine ocean," Moore later wrote in an essay for *Natural History*, "I was confronted, as far as the eye could see, with the sight of plastic. It seemed unbelievable, but I never found a clear spot. In the week it took to cross the subtropical high, no matter what time of day I looked, plastic debris was floating everywhere: bottles, bottle caps, wrappers, fragments." An oceanographic colleague of Moore's dubbed this floating junk yard "the Great Pacific Garbage Patch," and despite Moore's efforts to suggest different metaphors — "a swirling sewer," "a superhighway of trash" connecting two "trash cemeteries" — "Garbage Patch" appears to have stuck.

The Garbage Patch wasn't merely a cosmetic problem, nor merely a symbolic one, Moore contended. For one thing, it was a threat to wildlife. Scientists estimate that every year at least a million seabirds and 100,000 marine mammals and sea turtles die when they entangle themselves in debris or ingest it. "Entanglement and ingestion, however, are not the worst problems caused by the ubiquitous plastic pollution," Moore wrote. Plastic polymers, as has long been known, absorb hydrophobic chemicals, including persistent organic pollutants, or POPs, like dioxin, P.C.B.'s and D.D.T. Highly controlled in the U.S. but less so elsewhere, such substances are surprisingly abundant at the ocean's surface. By concentrating these free-floating contaminants, Moore worried,



particles of plastic could become “poison pills.” He also worried about toxins in the plastic itself — phthalates, organotins — that have been known to leach out over time. Once fish or plankton ingest these pills, Moore speculated, poisons both in and on the plastic would enter the food web. And since such toxins concentrate, or “bioaccumulate,” in fatty tissues as they move up the chain of predation — so that the “contaminant burden” of a swordfish is greater than a mackerel’s and a mackerel’s greater than a shrimp’s — this plastic could be poisoning people too.

In the scientific community, Moore’s work is somewhat controversial. Even marine biologists who share his alarm have misgivings about the sensationalism with which the Garbage Patch is sometimes described. Since the plastic debris in the North Pacific convergence zone is spread out unevenly across millions of miles of ocean, and since most of it is fragmentary, flowing through the water column like dust through air, the Garbage Patch bears little resemblance to a floating junkyard. But it is, numerous scientists assured me, very much for real. Beth Flint’s nuanced testimony was typical. Flint is a wildlife biologist with the U. S. Fish and Wildlife Service. One seabird she studies is the Laysan albatross, which, thanks to a recent Greenpeace ad campaign, has become plastic pollution’s most famous victim — its poster bird, if you will. The ad shows a photograph in which a slimy casserole of bottle caps, cigarette lighters and unidentifiable plastic shards spills from the downy belly of a necropsied Laysan albatross chick. “How to starve to death on a full stomach,” the caption reads. The image is not merely powerful, or shocking; it’s persuasively accusatory. Look, dear consumer, it seems to say; look at what you’ve done, look where what you throw away ends up.

There’s only one problem, Flint says. No one knows for certain whether plastic killed the albatross. Do plastic shards perforate the intestines of chicks? Sometimes. Does plastic obstruct the digestive tract or make a bird “starve to death with a full stomach”? Probably, in some cases. Then again albatrosses eat squid, and chitonous squid beaks are also indigestible. Are the toxins in and on plastics poisoning the birds, as Moore has proposed? It wouldn’t be surprising. According to Flint, long-lived seabirds like albatrosses do indeed have alarmingly high contaminant burdens. But research into the pathology of plastic poisoning is ongoing, and in the meantime, “it’s still all sort of circumstantial.”

Despite these caveats, Flint has little doubt that plastic is “clearly not good” for seabirds, and her praise for Moore is unequivocal. “I think that he’s done a tremendously valuable service to humanity by pursuing this when none of the big oceanographic or academic institutions or government institutions did,” Flint said. She predicts that other researchers will soon “get on his bandwagon.” Already her prediction seems to be coming true. In the last few years several studies of plastic poisoning appeared in prominent journals, including *Science*. The hardest question to answer about the Garbage Patch, it turns out, isn’t whether plastic threatens animals and ecosystems, but what, if anything, can be done about it. “We haven’t been able to hatch up any good ideas,” Flint admitted. Albatross chicks don’t forage on land, she said. In fact they don’t forage at all. Their parents do, flying far and wide across the Pacific, swooping down to snatch morsels off the surface, which they bring back home and regurgitate into a hungry chick’s mouth. That’s where all the detritus in that Greenpeace ad came from. Even if we were to clean every beach in the world, it wouldn’t keep albatrosses from stuffing their offspring full of plastic. “You’d have to clean the entire ocean,” Flint said.

During the few days I spent helping out at Gore Point, GoAK’s labors came to seem all the more Herculean. Cleaning up debris turns out to be slow, mind-numbing, back-straining work. We crouched amid the devil’s club, a few feet apart, like gleaners harvesting surreal produce — plastic gourds, fungi of foam. Every now and then someone would find something remarkable — a bottle with Arabic writing on it, a toy, a shoe, a Russian vacuum tube — and would hold it up for the rest of us to see, before pocketing it or, more often, dropping it into a bag with the other trash. When you stepped back to examine your progress, the difference would hardly be noticeable. But the hours and bags added up, and finally there was nothing left on that forest floor but a sprinkling of plastic foam.

Pallister wasn’t ready to celebrate. Even now, the success of GoAK’s rescue mission remained in doubt. He still didn’t know how he was going to remove all that trash from that windward shore, where the waters were rocky and the surf could be dangerously rough. The original plan was to load the bags onto six-wheelers, drive them across the isthmus to the protected leeward shore and transfer the bags onto a bow-loading amphibious barge, which would ferry them 80 miles to the landfill in Homer. But archaeologists with the Alaska parks department recently told Pallister, no six-wheelers. So now what? Sweat equity? Helicopters?



The week before, he spoke to a helicopter pilot who assured him that timber companies regularly airlifted logs out of forests as dense as this one. If GoAK loaded the debris into bulk bags, and if the weather wasn't too foul, it wouldn't be a problem. (A bulk bag is a giant, white, rip-proof plastic sack, the size and shape of a balloonist's gondola, that the shipping and construction industries use to sling cargo — more than 4,000 pounds of it — through the air.) The pilot would snake a hook down through the trees on a 125-foot cable, a man on the ground would catch it, snap on a load of bulk bags, and up through the branches they would go, three or four at a time. But standing in the forest, peering up through the dense canopy, Pallister was having a hard time imagining it, despite the pilot's assurances. "We're going to have to find some clearings for the helicopter," he said to Raynor.

Even if he could make the airlift work, it wasn't clear how he was going to pay for it. A chartered helicopter would run him approximately \$2,000 an hour, the barge \$4,000 a day. Already Pallister, who keeps a well-thumbed copy of Edward Abbey's "Monkey Wrench Gang" on his coffee table, had hit up dozens of corporate sponsors — Princess Cruises, REI, Alyeska Pipeline, BP, whose sunflower logo decorates most of GoAK's garbage bags. Then there was the weather to worry about. Autumn comes early to the Kenai Peninsula's outer coast. The barge and helicopter wouldn't be available until mid-August. By then, summer would be ending, the purple fireweed would have finished blooming and on the upper slopes of the Kenai Mountains the tundra would be tingeing red. By then the weather could turn. The southeasters could start howling in off the Pacific, buffeting the windward shore, making waves surge up into driftwood, stripping branches, scattering debris 400 feet into the trees. If that happened, you could forget about an airlift. If that happened, the crew would have to lash down the heaped bags with cargo nets and pray they survived the winter.

"That's not unusual," Charles Moore told me, when I described the midden at Gore Point. "Any windward side of an island's going to have situations like that. The question is, how much can we take? We're burying ourselves in this stuff." Moore sympathized with Pallister's motives, and said that GoAK's efforts could help "raise awareness." But if Pallister thought he was saving Gore Point from plastic pollution, he was fooling himself. "It's just going to come back," Moore said.

This, in Moore's opinion, is why the 2006 Marine Debris, Research, Prevention and Reduction Act is likewise doomed to fail. "It's all been focused on cleanups," he says of federal policy. "They think if they take tonnage out of the water, the problem will go away."

In the Northwestern Hawaiian Islands, whose shores are washed by the southern edge of the Garbage Patch, federal agencies are staging one of the biggest marine-debris projects in history. Since 1996, using computer models, satellite data and aerial surveys, they have located and removed more than 500 metric tons of derelict fishing gear in hopes of saving endangered Hawaiian monk seals from entanglement. The results have been mixed at best. Biologists are now finding fewer monk seals entangled in debris; but they are also finding fewer monk seals, period. Meanwhile, an estimated 52 tons of fresh debris inundates the Northwestern Hawaiian Islands every year.

Along with financing and volunteers, corporate sponsors of the International Coastal Cleanup contribute homilies about saving the planet. "Working together we help keep our coasts clean," ran Coca-Cola's contribution to the I.C.C.'s 2006 report. Marine debris, declared Dow Chemical, is a "people problem that we, the citizens of the world, have the power to stop." Is it? Yes, says Moore, but "there is no magic bullet," and the solutions may require sacrifices that the citizens, governments and corporations of the world are reluctant to make. Eventually we will have to abandon planned obsolescence, and instead manufacture products that are durable, easily recyclable or both, Moore said. And we will have to overcome our addiction to conspicuous consumption.

In the meantime, other smaller, more practical actions could be taken. In 1999, the National Resources Defense Council successfully sued the U.S. Environmental Protection Agency for permitting municipalities to pollute watersheds around Los Angeles. As a result of the lawsuit, Los Angeles County had to comply with stricter total maximum daily loads, or T.M.D.L.'s, the local pollution limits that the E.P.A. places on a region's waterways under the Clean Water Act. The new T.M.D.L.'s, the first in the country to treat trash as a pollutant, will require the county to reduce the amount of solid waste escaping its rivers and creeks from 4.5 million pounds a year to zero by 2016. To meet that target, cities will have to invest in "full-capture systems," filters that strain out everything larger than 5 millimeters in diameter. In theory, every region in the country could follow suit, but already cash-strapped governments in Southern California are complaining that these "zero-trash T.M.D.L.'s" are



too costly and ambitious to implement. Moore, meanwhile, has collected data showing that even full-capture systems would allow tens of thousands of plastic particles to escape the Los Angeles River every day. As nearly everyone I spoke to about marine debris agrees, the best way to get trash out of our waterways is, of course, to keep it from entering them in the first place. But experts disagree about what that will take. The argument, like so many in American politics, pits individual freedom against the common good. “Don’t you tell me I can’t have a plastic bag,” Seba Sheavly, the marine-debris researcher, says, alluding to plastic-bag bans like the one San Francisco enacted last year. “I know how to dispose of it responsibly.” But proponents of bag bans insist that there is no way to use a plastic bag responsibly. Lorena Rios, an environmental chemist at the University of the Pacific, says: “If you go to Subway, and they give you the plastic bag, how long do you use the plastic bag? One minute. And how long will the polymers in that bag last? Hundreds of years.”

“The time for voluntary measures has long since passed,” says Steve Fleischli, president of Waterkeeper Alliance, a network of environmental watchdogs to which, it should be noted, the Gulf of Alaska Keeper does not belong. (Waterkeeper officials have objected to GoAK’s use of their brand, but Pallister insists that their objections are without legal merit. “They’ve trademarked ‘Riverkeeper,’ ‘Soundkeeper,’ ‘Baykeeper,’ ” he told me, “but not ‘Alaska keeper.’ ”) Fleischli would have us tax the most pervasive and noxious plastic pollutants — shopping bags, plastic-foam containers, cigarette butts, plastic utensils — and put the proceeds toward cleanup and prevention measures. “We already use a portion of the gasoline tax to pay for oil spills,” Fleischli says. Such levies shouldn’t be seen as criminalizing the makers and sellers of plastic disposables, he argues; they merely force those businesses to “internalize” previously hidden costs, what economists call “externalities.” This market-based approach to environmental regulation, known as extended producer responsibility, is increasingly popular with environmental groups. By sticking others with the ecological cleaning bill, the thinking goes, businesses have been able to keep the price of disposable plastics artificially low. And as Pallister learned at Gore Point, the cleaning bill may be greater than we can afford.

We still have limited tax dollars to spend and scarier nightmares to fear. No one — not Pallister, not Moore — will tell you that plastic pollution is the greatest man-made threat our oceans face. Depending whom you ask, that honor goes to global warming, agricultural runoff or overfishing. But unlike many pollutants, plastic has no natural source and therefore there is no doubt that we are to blame. Because we can see it, plastic is a powerful bellwether of our impact upon the earth. Where plastics travel, invisible pollutants — pesticides and fertilizers from lawns and farms, petrochemicals from roads, sewage tainted with pharmaceuticals — often follow. Last June, shortly before my voyage in the *Opus* began, Sylvia Earle, formerly N.O.A.A.’s chief scientist, delivered an impassioned speech on marine debris at the World Bank in Washington. “Trash is clogging the arteries of the planet,” Earle said. “We’re beginning to wake up to the fact that the planet is not infinitely resilient.” For ages humanity saw in the ocean a sublime grandeur suggestive of eternity. No longer. Surveying the debris on remote beaches like Gore Point, we see that the ocean is more finite than we’d thought. Now it is the sublime grandeur of our civilization but also of our waste that inspires awe.

One evening in mid-August, despite N.O.A.A. forecasts calling for gale-force winds, a rusty 100-foot barge called the *Constructor* plowed its way in darkness from Homer to Gore Point, reaching the leeward anchorage just before dawn. Day broke to mild breezes and blue skies, which showed how much you could trust N.O.A.A. forecasts out here on the unpredictable coast. The helicopter was supposed to arrive by 10, bringing a local television news crew with it. Shortly before the appointed hour, Raynor, Leiser and Pallister’s elder sons assembled on Gore Point’s leeward shore. Dressed in fleece jackets and rubber boots, reclining on overstuffed bulk bags as if they were Barcaloungers, they gazed west, beyond the barge, to the Kenai Mountains, above which, any moment now, they expected the helicopter to appear. “God’s smiling,” Raynor remarked of the weather. “God’s saying: ‘Thank you. Thank you for cleaning up Gore Point.’ ”

A half-hour later, when the helicopter had not arrived, Raynor wasn’t so sure what God was saying. Had something gone wrong? Was Homer weathered in? The Pallister boys rose from their bulk bags, walked down to the surf and began amusing themselves with strands of bull kelp, whipping the slick green ropes toward the water as if casting lines.

At last, from the opposite direction than expected, the unmistakable throb of a rotor could be heard, growing louder. The four men turned almost in unison and shaded their eyes with their hands. But then the noise faded. The treetops tossed around in the wind. The men continued to stare. “They must be doing a flyover of east beach,” Leiser said. “Probably the TV crew wants an aerial shot.” The treetops kept tossing. At this distance the helicopter sounded like a neighbor’s lawn mower. Then, thundering, it appeared, swooping past, dark blue, alive



with gleams, flying low enough that it was easy to read the words “Maritime Helicopter” on its side. Here in the wilderness it seemed angelic. The pilot banked over the inlet, over the Constructor, where Chris Pallister stood on the deck looking up.

Donovan Hohn, a contributing editor of Harper’s Magazine, is at work on a book about a shipment of bath toys lost at sea.

TEAMS Member Spotlights

Mary Margaret Ulderich - Historian

TEAMS member Mary Margaret Ulderich has begun a new position as a ninth grade biology teacher at Henry County High School in Paris, TN. You may remember her leading sessions at the middle school level at both TEAMS and TSTA conferences. However, Mary Margaret decided to take the biology PRAXIS and is delighted to be teaching the one subject! Mary Margaret was instrumental in the revitalization of TEAMS in 2000, and is actively serving the organization as Historian. You may want to ask her about her beautiful photographs. She is also on the NMEA 2010 team. Keep up the good work, Mary Margaret! You are an inspiration to us.

Welcome New and Renewing TEAMS Members!!!

Dr. Michael Gibson – Martin, college level
David Wehunt – Chattanooga, high school level
Laura Crafton – Franklin, high school level
Amy Headrick – Knoxville, high school level
Debra Salts – Lebanon, middle school level
Linda Williams – Seymour, elementary level

Did You Know?

TEAMS Members Mollie Vann, Ramona Nelson and Gale Stanley sit on the Tennessee Science Teachers Association Board.

TEAMS Members Gale Stanley, Kathy DeWein and Donna Tompkins are extremely involved in planning the TEEA Conference in Oak Ridge this fall.

April Qualls – TEAMS Member

A 2007 graduate from The University of Tennessee at Martin, April Qualls is a 3-year member of TEAMS. She is beginning her second year of teaching 5th grade with the Benton County School System in Camden, TN. This year, April was asked by her principal to departmentalize and teach science as her main assignment! April received the 2008 TEAMS mini-grant and will use the award to teach about penguins. She attended her first NMEA conference in Savannah, GA this July and is eager to assist with NMEA 2010. Way to go, April.



Upcoming Events and Opportunities

Interested in presenting at TSTA in November?

Each year TEAMS hosts a strand of aquatic and marine sessions at TSTA. We are looking for presenters interested in showcasing how aquatic and marine activities can be incorporated into the new Tennessee State Science Standards.

We need all grade levels represented.

If you are interested in presenting a 45-minute session contact Fran Hamilton at hamiltonfrances@yahoo.com or Becky Cox at beckyc@utm.edu by September 1, 2008.

Tennessee Environmental Education Association Conference

The Tennessee Environmental Education Association invites you to the Doubletree Hotel in Oak Ridge for a weekend of activities related to energy education. Learn the history of Oak Ridge National Lab.

Choose from a variety of sessions and field trips on topics including elk in Tennessee, the UT Arboretum and Biology in a Box. Find out what TEEN is! Visit the Museum of Appalachia. Our keynote address, "Is Global Warming Real?" will be delivered by Dr. Mac Post from Oak Ridge National Lab.

The conference will take place September 19-21, 2008.

Admission: Full conference is \$100 (\$80 for students). Saturday only is \$70 (\$50 for students). Make hotel reservations at the Doubletree Hotel separately as needed.

For More Information: www.eeintennessee.org

Tennessee Science Teachers Association Conference

This year enjoy a joint conference between Tennessee Science Teachers Association and Tennessee Academy of Science. Besides the science content and pedagogical workshops that TSTA offers, attendees will be able to listen to presentations by Tennessee scientists and view posters displaying their work. This is a great opportunity to learn more about real world applications of science.

The conference will take place November 21-22, 2008 at the Sheraton Music City Hotel in Nashville.

The theme is 'Working Together to Raise the Bar: Excellence in Science Teaching and Learning. Preparing for the Celebration of the Year of Science 2009.'

For More Information: www.tnsta.org

2009 SeaWorld/Busch Gardens Environmental Excellence Awards

Since 1993, the SeaWorld/Busch Gardens Environmental Excellence Awards have recognized and rewarded K-12 student groups working at the grass-roots level to protect and preserve their local environment. In 2004, the program was expanded to include non-profit community groups with similar motives. The awards are held in cooperation with nine highly recognized environmental and conservation organizations: National Wildlife Federation, World Wildlife Fund, The Nature Conservancy, Conservation International, National Fish and Wildlife Foundation, National Geographic Society, Izaak Walton League of America, Hubbs-SeaWorld Research Institute and the National Science Teachers Association.

For more information, please visit our website at the link provided below. The site contains all of the program guidelines, a FAQ section, and specific instructions on how to apply. The top eight projects receive a cash award of \$10,000 and an all expenses paid trip to a SeaWorld or Busch Gardens theme park for 3 students and the program facilitator. We have also posted summaries of all of the winners from the past 8 seasons. The 2009 SeaWorld/Busch Gardens Environmental Excellence Awards program will accept project submissions from across the United States until 5 p.m. on Friday, November 28, 2008. <http://seaworld.org/conservation-matters/eea/index.htm>



Giant Squid

NOAA's Ocean Exploration Program, in partnership with the Smithsonian Institution Traveling Exhibition Service, and the National Museum of Natural History sponsored the development of the following. If you have not seen these educational products, you might want to check them out:

In Search of Giant Squid Curriculum Guide Compiled by the Smithsonian Institution Traveling Exhibition Service, the National Museum of Natural History, the National Aeronautics and Atmospheric Administration, and the National Oceanic and Atmospheric Administration, 2006. Geared for 5-8 grade students with special "roadmaps" for older or younger audiences. Includes detailed lesson plans, instructive websites, student worksheets, and comprehensive teacher answer keys. Also incorporates fascinating illustrations and instructive maps. Download free curriculum guide at:

http://www.sites.si.edu/exhibitions/gaint_squid_curriculum_guide.pdf

In Search of Giant Squid Challenge - Wonderful for students already engaged in the study of marine animals, this fun and educational brochure asks amateur squid researchers 14 questions about the mythical creature. Features questions, answers, and a fill-in-the-blank component. Go to:

<http://www.sites.si.edu/education/Squid%20Quiz.pdf>

The Giant Squid is coming to Gray Fossil Site in January for 3 months.
Be sure to check it out at www.grayfossilmuseum.org.

2008-2009 Ocean Gems Calendars are Now Available!

Dr. Diane R. Nelson's beautiful underwater photos are compiled in a 16 month calendar. Calendars are now on sale for \$10.

Contact Dr. Diane Nelson for more information at janddnelson@yahoo.com.

Prints used in the calendar, along with many others, are available for purchase at www.etsu.edu/reece. Click on Ocean Gems under Virtual Exhibitions.

Deadline for next *Pearl Button* Newsletter is November 1.

Submit all articles to Courtney Thompson at thompson@ripleys.com

Check out our website www.teamsoftn.org.

From the Mountains to the Sea



Gatlinburg, Tennessee 2010

Save the Date! July 19 – 23, 2010

www.nmeaweb.org



Please consider the environment before printing this newsletter.