

Fastest Growing Surface Feature in Our Oceans—Plastics

by Anne Murphy, Executive Director

At a recent lecture given by Dr. Curtis Ebbesmeyer, oceanographer and internationally recognized flotsam expert, many of us in the audience were stunned by what we learned regarding garbage afloat in the sea. We were surprised at Dr. Ebbesmeyer's opinion that on a scale of 1–10, an oil spill is a 2. He went on to give examples of other hazardous waste materials entering the ocean such as computer monitors spilled out of a container vessel (an 8) and the ubiquitous flow of insoluble toxic materials into the sea (a 10). Notably he rated the spill of plastic debris into the sea as a 9.

What's so dangerous about containers full of plastic tub toys or frisbees breaking lose from their transport ships and dumping their cargo into the sea? Or, since 80% of plastic-based pollution in the sea is generated from land, what threat is posed by the plastic water bottle we inadvertently trash instead of recycle? Well, for starters, all plastics ever produced still exist somewhere in the world. Captain Charles Moore of the California-based Algalita Foundation is fond of saying, "like diamonds, plastics are forever." So once we're through with them, they end up in ocean or freshwater sediments, floating or suspended in the ocean or bodies of freshwater, in soils, in landfills and in beach sand. Fog is known to carry sewage and red tide. Perhaps it even carries dust-like particles of plastic.

Plastics do not biodegrade. A bacteria does not exist that can recycle plastic into natural bi-products that are reused in a chemical or nutrient cycle. From exposure to sun and through physical abrasion, plastics break down into small pieces eventually becoming individual molecules too tough for anything to digest. Ebbesmeyer estimates that a single 1-litre plastic water bottle will eventually break down into enough pieces to put one piece on each mile of beach around the world. In addition to plastic fragments, the sea accumulates pre-production plastic pellets, tiny plastic bits, called nurdles, used to manufacture plastic products. Researchers are learning that plastic polymers are sponges for DDT,

PCBs and other oily pollutants. Depending on how long the plastic is in the ocean, these plastic bits turn into poison pellets for animals feeding on them.

For the past fifty years, plastics from around the Pacific Rim have been making their way into the ocean, fragmenting and accumulating in the North Pacific subtropical gyre. This gyre is home to the "Great Pacific Garbage Patch," as Ebbesmeyer calls it. Captain Charles Moore of Long Beach, CA is credited with bringing this Garbage Patch to the world's attention. He discovered it when returning home from Hawaii after a trans-Pacific race. Taking a short cut, he motored through the gyre and found plastic as far as the eye could see in every direction. This was the case for the entire week it took to cross the gyre. The gyre has become a plastic trashcan, a repository for bottles, bottle caps, wrappers, cigarette lighters, tooth brushes, fishing nets, rope pieces, toys, and lots of unidentifiable plastic fragments as well as large items. The Garbage Patch is reported to be the size of Texas. Some accounts say "twice the size of Texas." Using the more conservative size estimate and a reference we can all relate to, if this Garbage Patch was on land, it would take 13+ hours to drive across is at 60 mile per hour.



PHOTO: LAYSAN ALBATROSS CHICK, KURE ATOLL, 2002, CYNTHIA VANDERLIP FOR THE ALGALITA FOUNDATION.


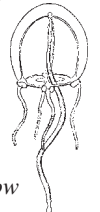











... Continued on page 2

Summer Hours
 Summer Opening Day—
 June 15



Natural History Exhibit
 & Marine Exhibit open
 Wednesday through Monday
 11am–5pm

IN THIS ISSUE

2	 Introducing the 25th Anniversary Fund	
3	 Summer Science Fun for Kids  Onshore/Offshore: Marine Ecology & Conservation for Teachers	
4	 Scientific Inquiry Pilot at PTMSC	
5	 Volunteer Profile: Dan & Soozie Darrow  What's New at the Burke	
6	 Summer Puffin Cruises/Adventurers Sail	
7	 25th Anniversary Reunion Party	
Insert	 PTMSC Anniversary Programming  Schedule of Events  It's Nature Walk Season!	

Since his first crossing, Captain Moore has been back three times to study the Garbage Patch. His findings are alarming, to say the least. The patch is growing. In 2001, Moore reported a 6/1 ratio of plastic to plankton—six small pieces of plastic to every one live zooplankter. Since some of the plastic arriving in the patch may have circumnavigated the gyre for untold years before finding its way into the quiet and still center of the gyre, much of it ends up being salt-shaker size. At this size, it looks like food to many plankton feeders. This is one way it enters the food chain. Plastic also enters the food chain as larger, colorful pieces resembling fish, shrimp or other prey that birds, turtles and marine mammals feed upon. Moore projects a tenfold increase in ocean plastics in the next decade.

I remember the first time I saw a picture of an albatross chick's carcass stuffed full of plastic debris. I couldn't figure it out. It didn't seem possible that a parent could swallow, regurgitate and feed this to their young chick. Sadly, some albatross colonies on remote islands in the Pacific have foraging ranges in the North Pacific Gyre. It has been estimated that over a million seabirds and one hundred thousand marine mammals and sea turtles are killed each year by ingestion of plastics or entanglement.

This isn't meant to be your daily dose of gloom and doom, rather a call for consumers to get educated, landlubbers and seafarers alike. At what point do we tip the scale towards an economic model that places a high value on environmental health?

The PTMSC is currently considering ways to build awareness of these plastics issues and

involve students and citizen scientists in conducting an audit to assess the levels of plastics on our beaches. In partnership with the Algalita Foundation, using their beach sampling guidelines, we have done an initial survey of some Jefferson and King County beaches including Fort Worden, Fort Flagler, Alkai, Fauntleroy and Golden Gardens. If you'd like to see data from the first sampling effort, visit our Citizen Science web pages at www.ptmsc.org/science/research.html.

To learn more about the research of Captain Charles Moore, visit the Algalita Marine Research Foundation's website at www.algalita.org/.

Sources:

- Personal conversations with Curt Ebbesmeyer and Charles Moore, 2006–2007
- "Captain Plastic on the Trail of Trash," an interview with Captain Charles Moore, *Satya Magazine*, April/May 2007
- "Trashed, Across the Pacific Ocean, Plastics, Plastics, Everywhere," *Natural History Magazine*, v.112, n.9, November 2003
- "Plague of Plastic Chokes the Seas," *Los Angeles Times*, August 2, 2006
- "Synthetic Polymers in the Marine Environment: What We Know—What We Need to Know—What Can Be Done," Charles Moore, Algalita Marine Research Foundation

From the Director ...

Introducing the 25th Anniversary Fund


In recognition of our 25th Anniversary, PTMSC is creating a special fund that will help us build an education legacy for a strong, sustainable future. We are thankful for all of the people who have been instrumental in making the Port Townsend Marine Science Center a success in the last quarter century. We are inviting you to participate with us in strengthening and growing PTMSC to meet the challenges of educating youth and adults about our fragile oceans and protecting our precious marine resources through scientifically informed stewardship in the next quarter century.

The 25th Anniversary Fund is a legacy for the future of the Marine Science Center. It will help the organization grow into our second quarter century, by allowing us to take advantage of educational opportunities and initiatives that our operations budget cannot accommodate. Examples might be a project on ocean plastics, the development of a global warming curriculum, or a more active role in Governor Gregoire's Puget Sound Partnership to clean up Puget Sound by 2020. The funding will also be used to give greater support to teachers in their standards-based testing (Washington Assessment of Student Learning or WASL) through providing excellent science education and being a strong partner with Fort Worden in its role as a life-long learning center.

Unlike an endowment fund, the funds would be available for immediate use, for leveraging other funding, and as bridge funding while waiting for grants. Our goal is to raise \$50,000 over two years which will be matched by a generous, anonymous \$50,000 gift. We will be contacting you in the next few months regarding your interest in participating in this exciting endeavor. For more details or to contribute to the 25th Anniversary Fund, please call JoAnne Heron, Development Director, at 385-5582, ext. 101.

Thank you for being a part of the Port Townsend Marine Science Center. We look forward to the next 25 years together.





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Octopress is a publication of the Port Townsend Marine Science Center, A 501(C) (3) nonprofit educational organization. Your comments, contributions, and support are greatly welcomed and appreciated. PTMSC is located at Fort Worden State Park in Port Townsend, Washington on the Olympic Peninsula.

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The Main Office is located on the 2nd floor of the Fort Worden State Park Office. The Marine Exhibit & Natural History Exhibit are located on the Pier and on the Beach at Fort Worden State Park.

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A Place for Kids to Jump Into Summer Science Fun

School's almost out! Do you have plans for your kids or grandkids this summer? If you're looking for something fun for them to do, while learning stuff too, enroll them in one of the hands-on science camps at the PTMSC.

What kid wouldn't be fascinated putting together a full skeleton of a gray whale or finding out who lives in a tide pool on a rocky shoreline? They can haul beach seines through eelgrass beds to look for the animals that live there or explore the hidden life in a pond.

Science camps at the Port Townsend Marine Science Center give kids experiential learning while they explore cool things about marine life and our natural environment.

Marine Biology Day Camp

July 16–July 20 Ages 9–13

Campers engage in exciting classes, labs and field programs. A few of the many captivating activities include: sieving through goopy sediments looking for brittle stars, pulling a seine net through eelgrass beds to learn where young fish hide and using microscopes to observe the "stuff" that supports all life in the sea. These activities give campers an opportunity to learn about individual groups of marine plants and animals, while taking an ecosystem approach to marine study. Day Camp cost is \$180.



Bones, Bugs & Bluffs Day Camp

July 23–July 27 Ages 8–12
Campers will use the Park's varied natural environments from beach and glacial bluff to forest, pond and meadow. They'll assemble skeletons of marine mammals, catch and learn about bugs, find out about earthquakes detected on a seismograph, investigate the life in a pond and make connections between fossil animals and their descendents alive today. With hikes, crafts, games and quiet times in a beautiful setting, this camp offers fun and learning. Cost is \$180.

Since the day camps are from 9am–5pm, it keeps them busy while you're working or, if you're a grandparent, it also gives you a few free hours to catch your breath and relax before they come back for dinner!

A **Marine Biology Residential Camp**, July 8–14, for ages 9–13, is also available, with housing in the barracks at Fort Worden State Park. Residential Camp is \$590. More information about all the camps is available at www.ptmsc.org.

Inspire your young scientist and create fun memories to last a lifetime!

PORT TOWNSEND MARINE SCIENCE CENTER INVITES K–12 TEACHERS TO ATTEND

Onshore/Offshore: Marine Ecology & Conservation for Teachers

July 29–August 3, 2007

The Port Townsend Marine Science Center is again offering its popular week-long marine science workshop, Onshore/Offshore for K–12 teachers, July 29th through August 3rd. Onshore/Offshore takes place on beaches, in science labs and onboard the *Adventuress* schooner, with credit and clock hour options

available and a tuition stipend for Washington teachers. For information contact the PTMSC at (360) 385-5582, (800) 566-3932, or e-mail info@ptmsc.org. You may also visit our Website www.ptmsc.org/education/teacher.html.

"This workshop was the best! The instruction was in line with the goals of the workshop as well as Washington EALRS. The information was presented in an engaging way and many new strategies were practiced."

—2006 workshop participant

Tuition: \$350 for Washington teachers; \$650 for out-of-state teachers, 50 clock hours and/or 5 credits available for an additional fee. Enrollment **limited** to 24 participants.



Welcome New Board Members, Linda Martin and Eric Harrington

Linda moved to Port Townsend last year, partly because of the volunteer opportunities presented by the PTMSC. Martin served on the Torrey Pines Docent Society BOD, the organization providing interpretive and other volunteer services to the Torrey Pines State Reserve (near San Diego). She also served on the Del Mar Library Friends Board, and was a founding member of the Green Institute, a public policy think tank. A published author, documentary film producer, and editor, Martin writes feature articles for several publications.

Eric brings his business and planning experience to the PTMSC Board. Before retiring last year, Eric was president and principal owner of a consulting firm that specialized in large computer systems projects and business improvement services to public entities, nonprofits and for profit organizations. He has served in executive positions with one of the largest international consortiums of accounting and consulting firms and has taught at the secondary, undergraduate and graduate level in the U.S. and Central America.



Scientific Inquiry Pilot at PTMSC

Judy D'Amore NHE Curator/Educator



This winter if you caught a glimpse of students doing experiments with live animals in the Discovery Lab or trooping up the hill toward Chinese Gardens Lagoon carrying water testing equipment, these activities were part of our Pilot Project on Scientific Inquiry.

Scientific inquiry is an important theme in science education these days. In past years scientists and science educators worried that students were leaving school believing that "science" was simply a fixed body of information, not understanding how the continual search for evidence allows scientists to clarify and improve our understanding of the world we live in. Today teachers are required to give students experience thinking and reasoning like scientists do, and gathering their own evidence to help answer scientific questions. For many teachers, this new emphasis on inquiry

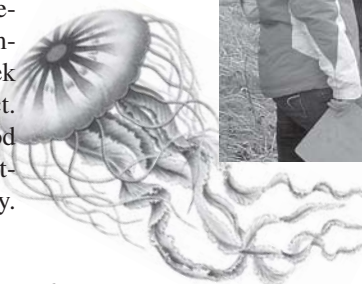
science comes on top of many other requirements they face. PTMSC is exploring ways that we can help teachers and students become more proficient in scientific inquiry through programs we offer. This school year we initiated the Inquiry Pilot with support from The Russell Family Foundation and the Charlotte Martin Foundation.

The Inquiry Pilot started in October 2006 with a workshop for five teachers representing Chimacum High School, Hood Canal School, Shelton Middle School and Truman High School in Federal Way. This winter each teacher brought his/her classes to us for two day-long sessions in which students carried out experiments in our lab and conducted field studies at two wetlands in Fort Worden State Park. Back at school, teachers and students have been developing field investigations in their own neighborhoods, with the help of local partner organizations.

As this article goes to press all investigations are still in the planning stages, but they promise to be interesting. Maren Johnson of Chimacum High School has her students developing their own research questions, comparing two study sites along Chimacum Creek that show different levels of human impact. Students in Laurie Byrd's classroom at Hood Canal School are visiting several distinct wetland types and comparing their water quality.

Roy Conover's 8th grade students at Oakland Bay Junior High are sampling Goldsborough Creek before it enters Shelton and as it leaves it, to find out how the city affects the creek. Teachers Susan DeAlcorn and Mary Ann Arens of Truman High School have their students working with the Muckleshoot Tribe in projects related to salmon enhancement.

At the end of the school year, students from the different schools will convene at a Student Congress to share their experiences and the results of their studies with one another. We're looking forward to these presentations and also to feedback from teachers that will help us choose the next steps in our ongoing involvement with inquiry science education.



Many Thanks to Those Who Contributed to Our 2006 Annual Appeal

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Admiralty Audubon Society is again donating full scholarships for two campers to attend Bones, Bugs & Bluffs Day Camp. Says Clara Mason, Chair of their Education committee, "We at Admiralty Audubon want to help young people whose families can't afford the cost to attend this camp. We feel strongly that kids should have the chance to learn about and develop a personal connection with this beautiful natural area we live in." Scholarship recipients will be asked to report back to the Society on their camp experience. To apply, please contact the PTMSC administrative office at 385-5582 or email info@ptmsc.org.



Volunteer Profile: DAN & SOOZIE DARROW



Scratch the surface of almost any project at PTMSC and you will find either Dan or Soozie Darrow, or both. This dynamic couple from Port Ludlow began their volunteer involvement after attending a low tide walk with Executive Director Anne Murphy in 2002. It must have been some walk—Dan and Soozie have been wearing a groove in the road from Port Ludlow to PTMSC ever since!

Dan is now in his second year as PTMSC Board President, applying skills from his long business systems career. In addition to that weighty job, he and Soozie are faithful members of the Saturday home crew, doing the very in-the-trenches work of cleaning touch tanks and feeding the exhibit animals.

From May to October, they also monitor the occurrence of harmful algae on a weekly basis through the ORHAB project. They both work on the Tides of March Auction committee and the Volunteer Advisory Committee, host Protection Island cruises, and are Marine Mammal Stranding Network volunteers. Soozie, who majored in zoology as an undergrad, also serves as a docent in the Marine Exhibit, went through training for a beach plastics monitoring project, and helps with a variety of administrative tasks, not to mention always being good for several dozen cookies for events. With all these activities, last year they logged about 500 volunteer hours between them, and more than 250 in the first three months of 2007.

Aside from work at PTMSC, they have found time to be involved in a number of restoration and monitoring activities with environmental organizations like Water Watchers and the North Olympic Salmon Coalition, and to be active with the Port Ludlow hiking club. Dan is an avid sailor who likes to race a 30' Etchells sailboat. When Soozie's onboard, she'd rather relax. They also enjoy spending time with their daughters and two grandchildren.

For the future, Dan is interested in working on the direction PTMSC takes as Fort Worden changes and grows, and seeing the education programs develop. Soozie enjoys learning from PTMSC lectures and from working with the exhibit animals. They both enjoy a good party and a good laugh. As the volunteer coordinator, I appreciate their ever present support, suggestions and encouragement.

—Jean Walat, Volunteer Coordinator

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WHAT'S NEW AT THE BURKE

Yellowstone to Yukon: Freedom to Roam

June 16–December 31, 2007



This new exhibit presents stunning wildlife photographs of the Rocky Mountains and documents the ambitious effort to preserve wildlife corridors all the way from Yellowstone National Park in Wyoming to Canada's Yukon Territories. Created by the Burke Museum in collaboration with The Mountaineers Books and Yellowstone to Yukon Conservation Initiative.

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Please Join Us for Our Summer Puffin Cruises or Sail on the *Adventuress* to Protection Island



Enjoy Port Townsend's gorgeous summer evenings aboard the comfortable 65-foot motor vessel *Glacier Spirit*, operated by Puget Sound Express, and look for puffins on Protection Island. It's hard to know which is more beautiful—Admiralty Inlet with the sun sinking into the west or the incredible wildlife on Protection Island! Beginning **Saturday, July 7**, the *Glacier Spirit* will depart from Hudson Point Marina in downtown Port Townsend at 6pm and return at 9pm. Additional

cruises will be on **July 7, 14, 21, 28, and August 4**.

Everyone loves puffins with their colorful markings and endearing expressions. The evening cruises offer a chance to see them in their natural habitat—with a fish in their bill, swimming, flying or diving. No matter what they're doing, they're fun to watch!

You are also invited to take a more leisurely trip to Protection Island on **Saturday, July 7**, aboard the classic 101' sailing schooner *Adventuress*, departing at 10am and returning at 4pm. Enjoy this historic sailing vessel while learning more about the wildlife refuge and its natural inhabitants. This is also a "bestseller" since we only offer the Protection Island Sail once a year. Call soon to make reservations!



Tickets for the evening Puffin Cruises on the *Glacier Spirit* are \$50 per person (\$45 for PTMSC, Burke Museum, Audubon or Washington Ornithological Society members). Tickets for the sail on the *Adventuress* on July 7, are \$75 per person (\$70 for PTMSC, Burke Museum, Audubon or Washington Ornithological Society members). Proceeds will benefit the PTMSC's educational programs. Reservations are required and may be made by phone at: (360) 385-5582 or (800) 566-3932 or e-mail: cruises@ptmsc.org.

Seth Bender Memorial Scholarship Fund

PTMSC's hands-on Marine Science and Natural History camps provide educational opportunities for boys and girls ages 8–18. This scholarship fund, established in memory of Seth Bender, provides tuition assistance for low-income families.

We sincerely thank the following who have contributed since our last issue:

Judith Adler, Martha Plotkin & David Reich, and Soroptimist International of PT.

Contributions to the scholarship fund are always accepted and can be sent to:

Seth Bender Memorial Scholarship Fund
Port Townsend Marine Science Center
532 Battery Way, Port Townsend, WA 98368



Many Thanks are due ...

- ✂ **Karen DeLorenzo** for contributing a megaphone to the Benefit Auction
- ✂ **Dan Darrow** for donating a laptop to the NHE bird song exhibit
- ✂ **Soozie & Dan Darrow** for contributing to the purchase of hand-held magnifying glasses



PROTECTION ISLAND SUMMER PUFFIN CRUISES

SATURDAYS, 6 PM TO 9 PM
JULY 7, 14, 21, 28 AUGUST 4

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NEW & RENEWING MEMBERS

Thanks! To our New & Continuing Members! The following folks have either joined or renewed their PTMSC membership since the Winter '07 *Octopress* was sent!

STUDENT

Rose Benoit
Brianna Deemer

INDIVIDUAL

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25th Anniversary Reunion Party

Saturday, July 14 2–6 pm



Twenty-five years ago Judy D'Amore and Libby Palmer had a vision for a marine science center. It started as a simple idea in a kitchen and, with the help of many people through the years, has grown into the center of marine education that we see today. With curiosity, friendship, fun and a love of learning, the cornerstones of what continues to drive all of us, it has morphed into an organization greater than either had first envisioned.

Please join us on Saturday, July 14, from 2–6pm, when we'll be celebrating our silver anniversary with a huge party, a variety of activities and a reunion for anyone who has played a part with us over these past 25 years. This bash includes everyone from past staff, volunteers, board members, campers, interns and counselors to Americorps, workshop participants, teachers, students, families and community supporters.

Come to our big party on the beach at Fort Worden State Park at the Kitchen Shelter. We'll have music, stories, photographs and, of course, yummy food. It's a chance to catch up with one another, hear about the vision for the future of PTMSC and reminisce about all the successes over the past years. (Do you ever wonder what happened to that great intern you worked with in 1988?)

Festivities start on the pier by the Marine Exhibit at 2pm with music. At 3pm a brief program will begin at the Kitchen Shelter, with special guest Kathleen Drew from the Governor's office. Appetizers will follow around 3:30pm and a barbecue dinner will start about 4pm. We'll provide the barbecue and you're welcome to bring side dishes for a potluck. Soft drinks and water will be provided.

Please also bring photographs to share—old, new and whacky—and we'll have a board where you can pin them up. If you're a musician, feel free to bring your instrument, or just chime in with your voice. A little PTMSC jammin' may be in order before the evening comes to a close.

Mark your calendars and spread the word! Please RVSP by e-mail to info@ptmsc.org or by phone at (360) 385-5582, ext. 104, by June 30. We're looking forward to seeing you all there. Let's party!



**PORT TOWNSEND MARINE SCIENCE SOCIETY
 FORT WORDEN STATE PARK
 532 BATTERY WAY
 PORT TOWNSEND, WA 98368**

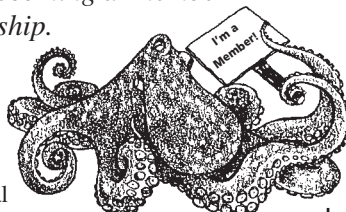
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- ◆ Unlimited free admission to the Marine Science Exhibit and Natural History Exhibit
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- ◆ 10% discount on all regular priced merchandise at our Gift Shop
- ◆ Discount admission to all PTMSC events: Protection Island Cruises, Speaker Series, etc.
- ◆ Reciprocal member privileges at the Burke Museum
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- ◆ All of the above plus unlimited free admission to the Marine Science Exhibit and Natural History Exhibit for your family
- ◆ Tuition discounts for the PTMSC Hands-On Summer Science Camps

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- ◆ All of the above plus 2 free admission tickets for friends

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