

## Milestones by Year

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### 1990

Susan Shaw, as a doctoral student at Columbia University, founded the Marine Environmental Research Institute (MERI) in 1990 to address the growing threat of chemical pollution in the oceans as evidenced by large-scale mortalities among marine mammals (seals and dolphins) in Europe and along the U.S. Atlantic coast. She formed MERI as a 501(C)3 charitable corporation in March 1990 and appointed a Board of Directors and an international Scientific Advisory Board. At the first Board meeting in 1991, she laid out the mission, vision, and values of the new institute. The branding firm, Sundberg Associates, created MERI's graphic look and its first brochure showing a map of marine mammal mortalities worldwide.

### 1990 – 1999

The Pacific Coast Seal Study was MERI's first research project (and Dr. Shaw's thesis project), which documented immune and endocrine-disrupting effects of chemical contaminants in harbor seals and northern elephant seals along the U.S. Pacific coast. The multidisciplinary, multi-institute project concluded with her thesis and DrPH degree (Doctor of Public Health/Environmental Health Sciences) from Columbia's School of Public Health. Over this decade, MERI's Board of Directors was chaired by Dr. Lemuel Evans, an NIH senior administrator and genetics scientist, and included Elisabeth Mann Borgese, the distinguished Professor of Ocean Policy/Law of the Sea and ocean advocate, who was one of Susan's mentors.

### 2000

Dr. Shaw established the MERI Center for Marine Studies in the coastal village of Blue Hill, Maine, to expand MERI's research and operations in the northwest Atlantic. Located at the mouth of the harbor flowing into Blue Hill Bay and the Gulf of Maine, the Center provided MERI with a field research station and a small marine laboratory. With the purchase of the RV MERI, a Downeast-style boat, MERI gained access to a wealth of marine species for research and education, including marine mammals. With its public lecture space, sea lending library, and saltwater aquarium, MERI quickly became a vibrant part of the greater Blue Hill community, offering diverse ocean education programs including summer Eco-Cruises, school programs, a lecture series, and marine internships.

### 2001

MERI launched *Seals As Sentinels*, its long-term region-wide research along the Atlantic coast, and began collecting marine mammal tissues for contaminant analysis through collaboration with the NOAA NMFS Northeast Region Stranding Network. By 2005, MERI had established a large marine tissue bank (tissues stored in freezers at -80 degrees) and began to produce peer-reviewed science describing the widespread contamination of marine mammals (seals) and fish in the Gulf of Maine/northwest Atlantic by persistent organic pollutants (POPs) including flame retardant chemicals and heavy metals such as mercury.

2002 – 2006

MERI's 1<sup>st</sup> *Capital Campaign* to establish the Center for Marine Studies raised \$1.75 million and attracted ongoing funding from private foundations (Britton Fund, Stroud Foundation, Sasco Foundation) for the expansion of the MERI Center and its laboratories and research.

**2003**

Dr. Shaw established MERI's *Ocean Environment Lecture Series* featuring acclaimed international experts such as David Gallo, Nancy Knowlton, Jeremy Jackson, and Carl Safina on critical ocean issues. The annual distinguished lecture was named in honor of Elisabeth Mann Borgese.

**2004**

In spring 2004, MERI began monitoring the health of the Blue Hill Bay coastal ecosystem. From April through October, researchers measured a suite of water chemistry indicators as well as nutrients, phytoplankton (red tide) and bacteria at 40 freshwater and marine sites. The project was the only comprehensive monitoring effort of its kind and provided an early warning signal to residents and officials about threats to the environment and public health. The expanded *Blue Hill Bay Coastal Monitoring Project*, in its 8<sup>th</sup> year in 2004, included studies of pinniped ecology (harbor and gray seals), invasive species, and ocean acidification.

**2005 – 2006**

With a grant from the Grayce B. Kerr Fund, MERI conducted a study of toxic contaminants in farmed salmon from Maine and eastern Canada. With the publication of this study's findings in top journals, MERI entered the controversial realm of seafood safety. The findings revealed that the industry practice of fast-growth salmon production on a high-fat diet resulted in fattier fish containing higher levels of cancer-causing chemicals (PCBs) than wild salmon. The study also challenged current dogma that removing skin from fish before cooking removes the contaminants and called for improved labeling of farmed fish in the marketplace.

**2006 – 2011**

MERI increasingly engaged in advocacy for the ocean environment/public health. It regularly began reporting findings on toxic chemicals to the public, the media and policymakers.

**2006**

*Salmon Farming Restricted in Maine Coastal Waters*: MERI published its findings on chemical contaminants in farm-raised salmon from Maine and eastern Canada. The study showed that salmon farming is a point-source of pollution in coastal waters and a health threat to consumers. Levels of cancer-causing PCBs and flame-retardant chemicals were higher in farmed salmon than in wild salmon. Furthermore, it showed that removing skin before cooking does not remove the contaminants. Testimony provided to the Maine Legislature resulted in increased regulations of salmon farms in Maine and the subsequent closure of farms in Blue Hill Bay. The findings were publicized with Dr. Shaw's press conference and lecture at MERI in September 2006: "*Taking the Skin Off: The Truth about Chemical Contaminants in Salmon.*"

**2007-2009**

In 2007, MERI testified before the Maine legislature on DecaBDEs (Deca), a developmental neurotoxin. Based on its preliminary data, MERI's testimony resulted in the overwhelming passage of House Speaker

Hannah Pingree's bill to ban Deca in certain consumer products in Maine by 2010. This led to the U.S. phase-out of Deca (U.S. Rep. Chellie Pingree's bill) in 2009. The MERI study found Deca in harbor seals and commercial fish from the NW Atlantic/Gulf of Maine (published 2008, 2009). The industry claimed Deca was "safe" because it did not bioaccumulate. The study showed otherwise: Deca accumulates all the way to top marine predators and their offspring (through breast milk). This study was the first to show Deca contamination throughout the marine food web. The study showed that Deca biomagnifies in seal livers from their consumption of fish; this finding has implications for oceans and human health (publication submitted Feb 2011).

## **2008**

MERI submitted Federal Appropriations applications for NOAA FY 09 funding in the amount of \$350,000 for its *Seals as Sentinels* research project. The project produces data on toxic contamination in harbor seals and fish in the Gulf of Maine ecosystem. The major objectives were 1) to increase understanding of linkages between toxic exposure and health problems in these species; 2) to determine whether current-use (unregulated) compounds are increasing in tissues; 3) to characterize potential sources of contamination; and 4) to provide data to guide ecosystem management and public health policy in the region.

## **2010**

MERI launched an immediate response to the Gulf of Mexico oil spill tragedy, leading a national debate on the massive use of toxic chemical dispersants in the Gulf. MERI published the Gulf EcoTox study on chemical dispersants, and collected Gulf samples to be analyzed, providing information about the presence of dispersed oil contaminants (hydrocarbons and toxic metals) in the Gulf environment and fish.

## **2010**

Dr. Shaw co-authored the San Antonio Statement, a Scientific Consensus About Hazards of Flame Retardants, questioning the widespread use of toxic flame retardants. Signed by nearly 300 scientists from 22 countries, the statement pointed to growing evidence that brominated and chlorinated flame retardants are accumulating in humans and the environment, harming unborn children, affecting people's hormones, and playing a role in causing cancer. It called not only for the use of alternative chemicals, but also for innovative changes in product design, which could reduce the need for toxic flame retardants.

## **2010**

MERI provided key testimony to the Maine Board of Environmental Protection, citing evidence of the health hazards of BPA (Bisphenol A), an endocrine-disrupting component of plastics, as well as evidence suggesting that BPA and nonylphenols may have been responsible for lobster die-offs in Long Island Sound. In December, the Maine BEP set the stage for phasing out BPA and other priority toxic chemicals under Maine's Kid-Safe Products Act. Maine was the 9<sup>th</sup> state to ban BPA from consumer products and children's toys.

## **2011**

Dr. Shaw provided testimony to the new Joint Standing Committee on Regulatory Fairness and Reform opposing Gov. LePage's proposals to repeal the BPA rule and the Kids Safe Product Act. Bi-partisan legislators invited Dr. Shaw to act as a resource for this committee and other committees as bills come up. They also asked her to help them define "sound science" per the Governor's definition. In a *Bangor Daily News* article (Feb 22-25) Dr. Shaw was interviewed by Maine Public Broadcasting where she

responded to the Gov's gaff about BPA at worse giving women "little beards." The story went viral by environmental media around the world.

## **2011**

Dr. Shaw was the lead author of a landmark review article on flame retardants. Co-authored by international scientists and NIEHS Director Dr. Linda Birnbaum, the review exposed new evidence of the hazards of brominated and chlorinated flame retardants in consumer products (including baby products), and refuted industry's claims that adding these chemicals to products saves lives during fire events. The release of this paper in March 2011 was highly publicized and coincides with legislation in California and with national legislation.

## **2012-2017**

The Institute pioneered microplastics research in Blue Hill Bay, Maine. Alarming findings about the presence of microplastics in coastal waters, concern for human health (via seafood consumption) began to drive legislation and media attention. By 2017, the Institute was involved with large, multi-year projects and partnerships: ocean sentinels/climate change research with Sweden, Greenland and Iceland; analysis of microplastics in tissues of mussels, fish, marine mammals; and proposed fire fighter cancer biomarker studies in California and Arizona.

## **2018**

The Marine & Environmental Research Institute is renamed the Shaw Institute to honor Dr. Shaw's 30-year legacy and accommodate the organization's global research profile with emphasis on improving human health. The Institute remains dedicated to investigating the impact of chemicals on human and wildlife health, informing legislators and educating the public about the risks they pose, and protecting people and wildlife from the growing quantities of toxic substances in the environment. From flame retardants to plastics, its discoveries have informed public opinion and fueled key legislation which impacts millions of people in Maine and across the country.

## **2022**

Dr. Susan Shaw passed away in early 2022, leaving her science legacy in the hands of Charles ("Charlie") Rolsky, who joined Shaw Institute as Senior Research Scientist, with Michelle Berger as Associate Scientist. Dr. Shaw had recruited Dr. Rolsky from Arizona State University's (ASU) Biodesign Center for Environmental Health Engineering. With a doctorate from ASU, Dr. Rolsky conducted groundbreaking research on marine and aquatic plastic pollution, creating new analytical tools and methods, and collaborated with ASU's Fulton School of Engineering on several microplastics projects, including developing non-invasive research methods to collect information on overall species health. Read about Dr. [Rolsky](#) here.

## **2022**

The Shaw Institute continued to honor Dr. Shaw's legacy, re-opening the Blue Hill Research facility after two years of the Covid 19 pandemic; launched a new service, available to the public, to analyze the presence of "forever chemicals" (PFAS) in homes and the environment, and entered into a collaborative partnership with world-renowned scientists from NYU/Langone and Harvard University on a groundbreaking study on the impact of microplastics on human health.

## **2022**

Two peer-reviewed research papers co-authored by Shaw Institute researchers are published utilizing data from its "Three-Oceans" project on legacy and alternative flame retardants in nine species of marine mammals: 1) *Spatiotemporal trends of legacy and alternative flame retardants in harbor seals from the coasts of California, the Gulf of Maine, and Sweden*; and 2) *Hepatic fatty acid profiles associated*

*with exposure to emerging and legacy halogenated contaminants in two harbor seal populations across the North Atlantic.*

### **2023 Forward**

Two additional studies are published based on data from its “Three-Oceans” research on legacy and alternative flame retardants in nine species of marine mammals: 1) *Exposure to legacy and alternative flame retardants in two harbor seal populations and the association with blubber fatty acid profiles.* and 2) *Alternative and legacy flame retardants in marine mammals from three northern ocean regions.* An additional study of brominated flame retardants in harbor seal pups from the Gulf of Maine region was also published in 2023: *Occurrence and tissue-specific partitioning of alternative brominated flame retardants in northwest Atlantic harbor seal pups (Phoca vitulina vitulina).*