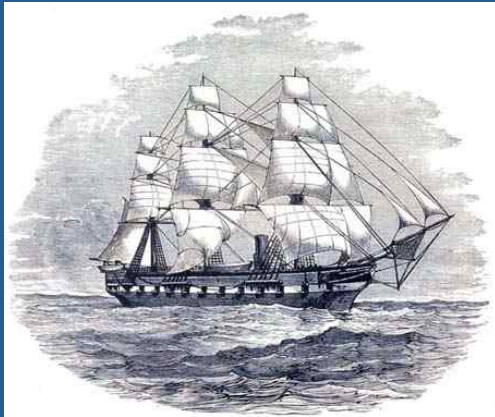




# Greening the UNOLS Fleet

Bruce H. Corliss, Jon Alberts, Annette DeSilva

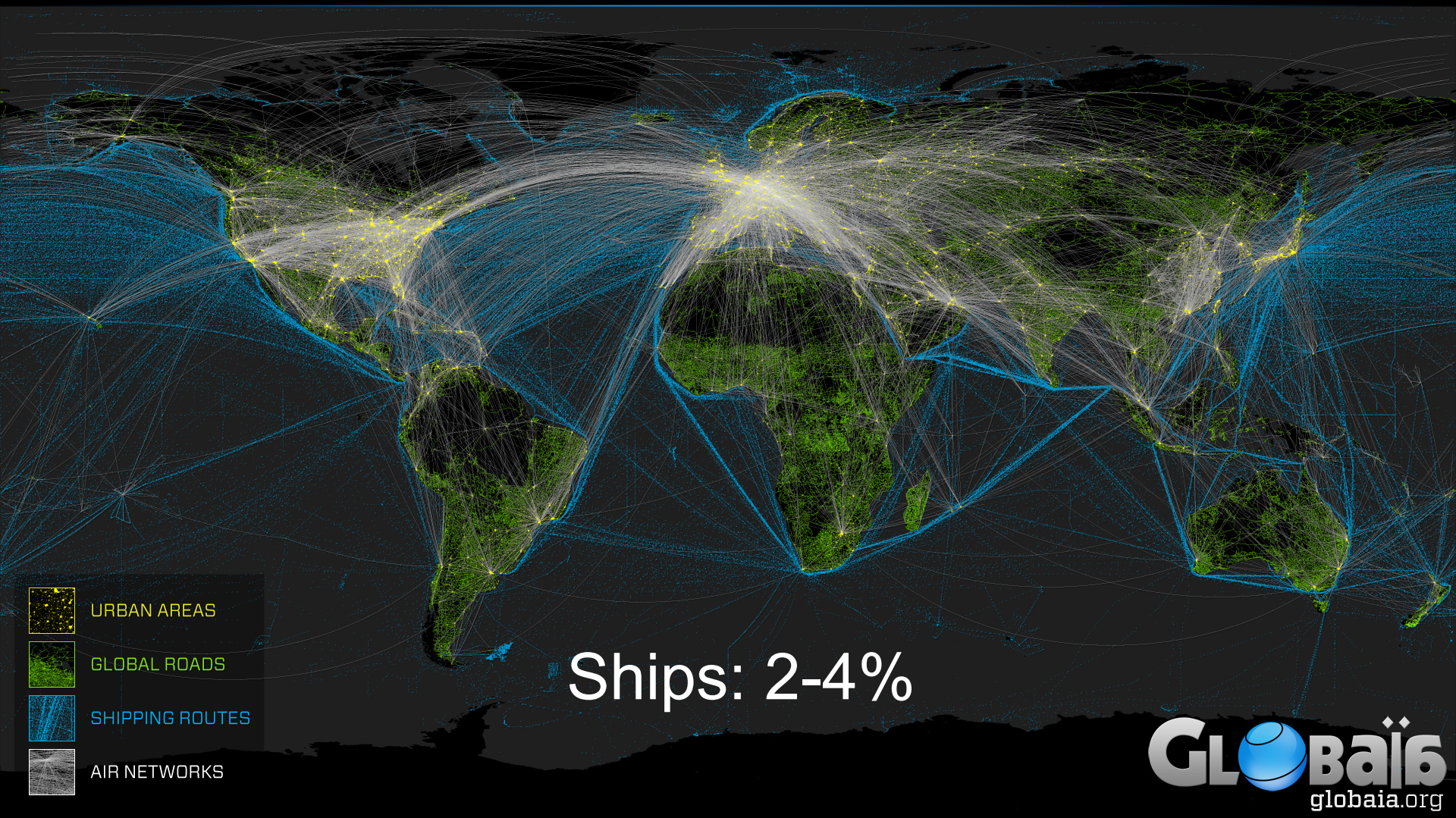


?????



<http://www.geology.19thcenturyscience.org/books/hmsc.jpg>

# THE GLOBAL TRANSPORTATION SYSTEM



[http://grist.files.wordpress.com/2011/07/anthropogenic\\_planet.jpg](http://grist.files.wordpress.com/2011/07/anthropogenic_planet.jpg)



## 2010 UNOLS GOAL

"Greening the Fleet – UNOLS should explore how to make the present and future fleet more environmentally sustainable. New and existing technologies and practices should be used in the construction, operation, and recycling of research vessels and UNOLS should take a leadership role in promoting a green U.S. research fleet, as we move forward in developing the academic fleet."



## **LONG TERM GOALS:**

- 1) Promote environmental sustainability within UNOLS
- 2) Guidelines for construction, operation and recycling of UNOLS Research Vessels
- 3) Promote environmental awareness on UNOLS ships with U.S. ocean scientists (outreach)
- 5) Ocean Class and Regional Class vessel construction



## Creating a Green Fleet

Life Cycle of a Vessel:

- 1) Construction
- 2) Operation
- 3) Recycling



Hornblower Yachts- San Francisco: Ferry Design



## Construction and Operation

- 1) Hull and design
- 2) Propulsion, fuel and lubricants
- 3) Power systems
- 4) Fluids; water and sewage
- 5) Interior: cabins, labs, galley and mess areas (Leadership in Energy and Environmental Design-LEED)

# Sail: Derik M. Bayliss



# Solar



## Planet Solar

31 m long, 15 m beam  
1.5 m draft  
Average speed-5 knots  
Crew of 4

2010-2012 Circumnavigation



# Solar Sailor:

\*Solar wings used as solar collectors and as sails



<http://www.solarsailor.com/>

# Carolyn Dorothy: First hybrid tugboat

Foss Marine, Seattle



# Power Systems



The *M/V Auriga Leader* has 328 solar panels to provide power for the ship's main electrical grid. (<http://www.inhabitat.com/2009/07/06/auriga-leader-cargo-ship-gets-power-from-solar-panels/>)

# BIOFUELS: Ethanol and Biodiesel

Objective: convert Great Lakes vessels with petroleum-based fuels to renewable and environmentally friendly products

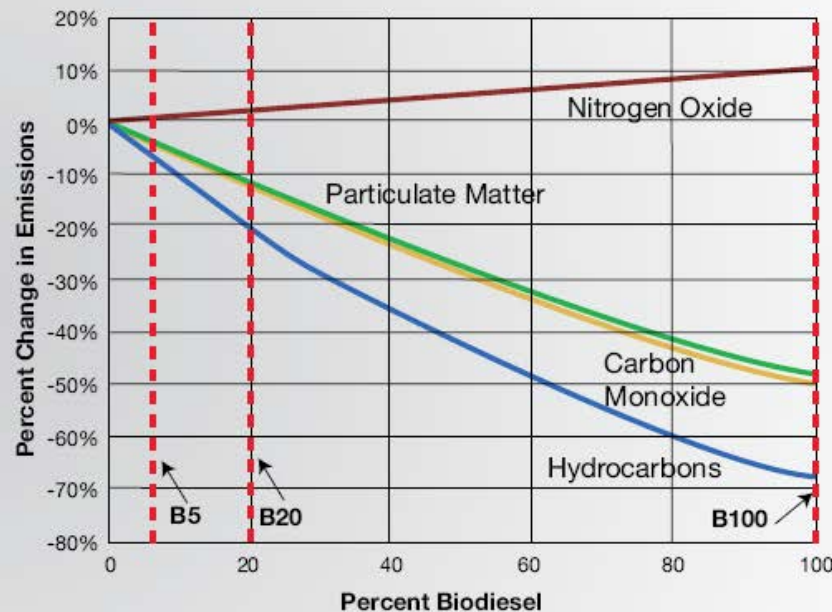


## ***NOAA GREEN SHIP INITIATIVE*** ***Development of Biodiesel and Bio-Products in Marine Applications***

### ***Environmental Research That's Environmentally Friendly***

There were many motivating factors for undertaking the Green Ships project. These include:

- ◆ Reducing ecosystem impact of ship-based research activities.
- ◆ Reducing workplace health and safety hazards.
- ◆ Advancing renewable technologies.
- ◆ Lessening dependence on fossil fuels.



Source: US EPA Report 2002, Document #EPA420-P-02-001

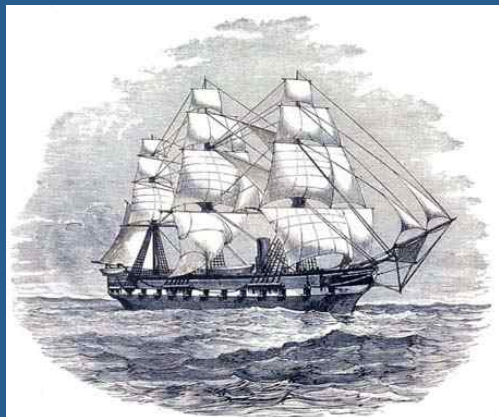


# Greening the Research Fleet

January 10-11, 2012

Nicholas School of the Environment

Duke University



?????



<http://www.geology.19thcenturyscience.org/books/hmsc.jpg>

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THINK BIG  WE DO



## GREEN BOATS AND PORTS FOR BLUE WATERS

A Workshop to Promote Environmental  
Sustainability of Boats and Ports  
April 8-9, 2014



## **Greening the U.S. Academic Fleet: A UNOLS Workshop**

**Objective:** An Assessment of Current Technologies, Designs and Practices for Environmentally Sustainable Research Vessels

**Composition:** Participants from UNOLS, NSF, Navy, NOAA, architects and naval designers, industry, and marine scientists



## Green Workshop Findings

1. Sail-assist vessels with a small environmental footprint can be used for particular operations.
2. Hybrid power systems and new technologies should be considered as options for future vessels.
3. Vessel energy management consisting of detailed energy audits and on-going monitoring can be carried out with existing vessels.
4. Biofuels and bio-lubricants and an environmental management plan can reduce a vessel's environmental impact and may be appropriate for some vessels.





## Green Workshop Findings

5. Development of an environmental classification system will help operators and agencies identify environmental issues and successes in the fleet.
6. Environmental sustainability of UNOLS support facilities and ports should be considered in parallel with vessels.
7. Culture: Environmental sustainability can be enhanced by incorporating both technological innovation and attitude changes (green culture) amongst ship operators and users.



## GREENING THE FLEET: FUTURE CONSIDERATIONS

- \* Additional costs will be incurred to address or incorporate “green” solutions
- \* Many of these expenses will be front-loaded: construction phase, but
- \* Green technology may reduce operational costs during the lifetime of the vessel
- \* Green solutions need to be customized for individual ships or missions

# RCRV

## Clare Reimers, Oregon State University



Fall, 2021  
Fall, 2022

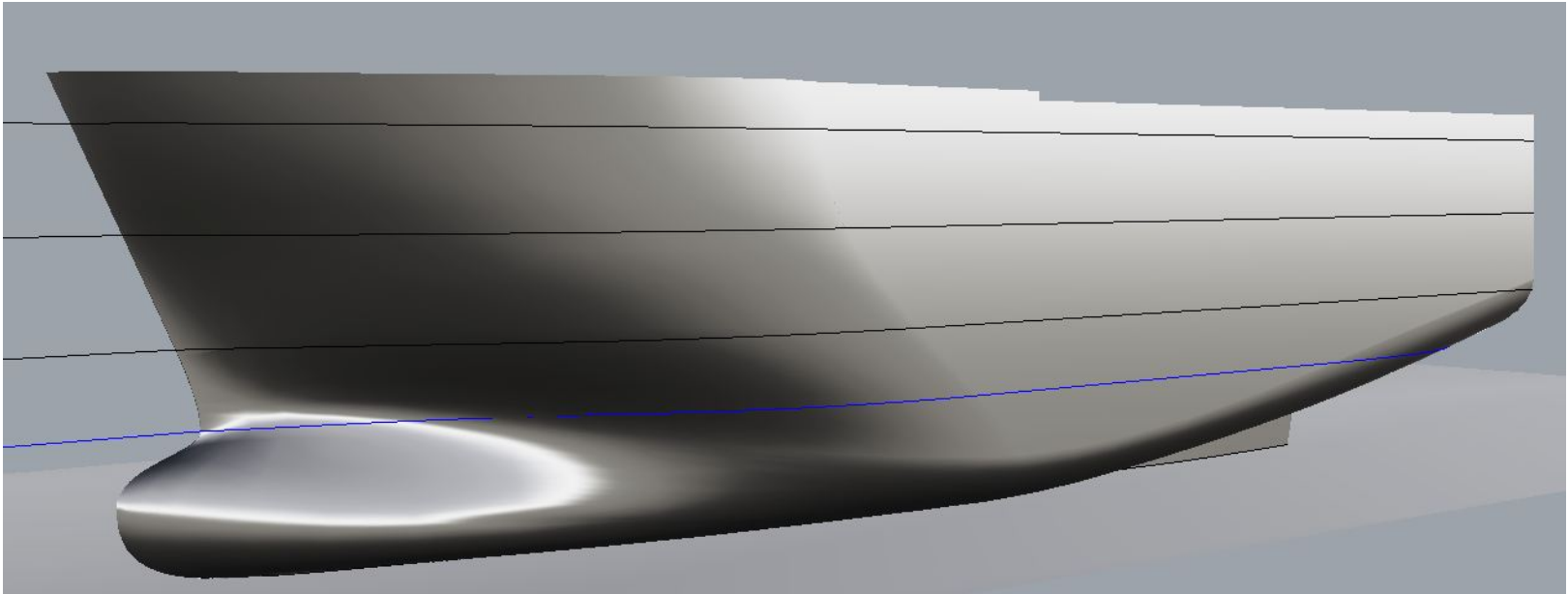


## RCRV Greening

- EPA tier 4 engines
- Biologic marine sanitation device
- Waste heat recovery system
- Low underwater noise
- Variable frequency drives
- Smooth, non-biocide hull coating

# Hull Form

- 30,000 model runs to optimize hull
- Modified Bulbous Bow
  - Increases fuel efficiency by up to 6% at cruise speed
- Weight: Greater requires more power
  - Lightweight Construction Materials (as practical)
  - Minimized ballast and no fixed ballast





## UNOLS Fleet progress

- LED lighting installed in many vessels
- Synthetic engine oil; environmentally friendly lubricants
- Solar reduction film on windows; hull paints to reduce heating
- Reducing cruising speed when feasible
- Recycling
- Port storm water mitigation



## UNOLS Fleet progress

- Cold ironing
- Biofuel ( 100% renewable biofuel- R/V Sproul; R/ V Blue Heron)
- R/V Sikuliaq: energy monitoring after one year

# Around the Pier: Scripps Now Powering Point Loma Ship Facility with the Sun

on OCTOBER 7, 2012 · [2 COMMENTS](#)



*Nimitz Marine Facility installs photovoltaic system*

100kW solar array



# Graduate School of Oceanography Campus Master Planning Underway

- \* Environmental Sustainability of Campus and Marine Facilities



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