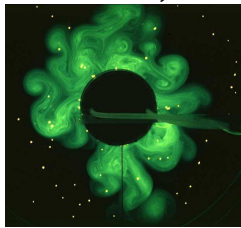


## Coffee-shop thoughts for future oceanographers

Peter Rhines, University of Washington, February 2008



I am sitting on a Saturday morning in 3d Place Books/Honeybear Bakery, a Seattle bistro that combines three of the city's great pleasures: reading, eating muffins and drinking single-tall latte's. The snow depth is at waist-level in the North Cascades a short drive away (so far this winter, about 40 feet has fallen near Mt. Baker and Paradise meadows on the flanks of Mt. Rainier, where 50 feet of snowfall is just an average year. For the first time in many years all three mountain passes connecting us with the outer world were closed by avalanches.). But here in the city the sun playfully reminds us that the February daffodils are pushing up, the austral summer is waning and we look expectantly forward to the endless sun and twilights of a Seattle summer.

The wall of this bistro is lined with posters, a sort of triptych of Northwest events, causes, concerns, concerts. But I notice that many of them, probably 25%, relate directly to us: the new generation of oceanographers. It is not that they all announce the Low-Tide Festival of June, when the year's deepest solstice spring tides bare the seafloor and its biological treasures. Instead, these posters are about global change in all its forms: Polar Science Weekend at Seattle's Museum of Science, led by UW's Polar Science Center; Climate Change, a Wakeup Call (public lectures on climate change sponsored by JISAO, one of the many climate, atmosphere, oceans groups at UW); Focus the Nation, a day of teach-ins at UW on global warming; Puget Sound Initiative, recently formed by the State's Governor, Christine Gregoire, recognizes that an ocean estuary must breathe to sustain its rich ecosystem, from Orca whales to geoducks. The Whitaker brothers who have led climbs of Mt. Everest announce a public Climb for Clean Air in summer 2008 on 14,410 foot Mt. Rainier.

Welcome to Ecotopia. A book, with this name, years ago visualized the USA divided cleanly into a few super-states. The northwest corner was occupied by people who so adored and preserved nature and wilderness, that they seceded from the Union. So green that we rust unless we are oiled.

As a graduate student in oceanography you are introduced to ideas bigger than any you will have yet encountered; bigger even than waves, tides, carbon cycles, plate tectonics, photosynthesis, and ocean circulation (though these are pretty big ideas). Global change is happening, whether or not the world warms by a few degrees. In Ecotopia you will know that these ideas are not abstract. Meet Ron Sims, the Administrator of King County, Greg Nickels, Seattle's mayor and Chris Gregoire, the Governor. All of them were in the front row when Al Gore came here to present a private preview of *An Inconvenient Truth* for UW's climate scientists. Each of them, Nickels, Sims and Gregoire, is in this sphere more than a politician. They have together set out to redefine the role of cities, counties and states as leaders in creating, against looming bad odds, a sustainable future in which people and ecosystems are in balance with one another, and the Earth hums along like an alpine Cascades meadow in spring.

Grad students in the University of Washington's School of Oceanography<sup>+</sup> quickly find that global change is so multi-dimensional that the multi-disciplinary approach of our program makes sense. A rising exponential,  $\exp(kt)$ , looks a lot like a brick wall as you approach it from the left. By the time our current entering class comes to graduate (and we hope that will be 4 to 6 years hence) there will be another 350 million humans on Earth, totaling 7 billion, or *twice* the population when I was a graduate student. 20% more fossil energy will be burnt each year, global sea level will be 2 to 4 cm higher, and we can only guess what one US dollar will buy. Students must be quick on their feet, quick to learn about neighboring fields, yet deep in their special expertise. Some of the current directions to reach toward are atmospheric sciences (we need ocean/atmosphere scientists, not only oceanographers), geochemistry and ecosystem biology. These are all part of our out-of-option core curriculum at UW.

One thing we urge students to do is teach. Beyond their focused research problem they should be broadly able and aware and qualified to teach, for example, undergraduate English majors about the global environment. The skills that will be developed here are widely applicable.

Basic biology, physics, chemistry or geophysics form a substrate on which to build the structure of the natural world, its webs of interdependence and its rapid, even chaotic change. Life emerged from the seas long ago and the seas are a good place to begin a career studying the natural world. We believe that our research programs in the School of Oceanography, sited in the heart of one of the best-funded of research universities, provide for education which is deep, broad and yet forward looking.

One of our 2d year graduate students, Nick Beard, works on robotic undersea Seagliders conceived and built in the School of Oceanography. While they patrol the global conveyor belt circulation near Iceland, he pilots them from our 'mission control center' and analyzes their 'cat-scans' for signs of turbulent fluid mixing. But last month he was doing CFC measurements in the deep ocean near Antarctica. His ports of call for this expedition (led by Prof. Greg Johnson of our PMEL faculty) were Easter Island and Punta Arenas, Chile. This week he ventured to the north end of Vancouver Island, took a small plane to the native village of Bella Bella on the Inside Passage of B.C., commandeered a small boat and successfully rescued a Seaglider that had drifted in from the open ocean. This is the life of our grad students, a combination of scholar, Indiana-Jone kind of adventurer, environmental activist and the seafaring explorers who are our scientific ancestors.

<sup>+</sup>and its closely collaborating Applied Physics Lab, Pacific Marine Environmental Lab (NOAA-PMEL), Joint Institute for Study of Atmosphere and Ocean (JISAO).