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and chemical processes in the ocean (e.g., bubble injection, surface films) and quantification of the associated gas flux. The chapter closes by covering specific chemical interactions that affect gas exchange.

Chapter 11 presents the global carbon cycle in the context of the increase of anthropogenic carbon in the atmosphere and ocean, and it explains mechanisms of atmosphere-ocean carbon exchange through chemical and biological processes (the “solubility pump” and the “biological pump”). The chapter also offers detailed discussions of the history, mechanisms, and outcomes of partitioning of anthropogenic carbon among the atmospheric, terrestrial, and oceanic reservoirs (e.g., the Revelle factor and the Keeling curve). This chapter provides important context for many of the

chemical tools presented in the book through a contemporary application of major societal interest.

Chapter 12 ends the book with a presentation of reactions in sediments, including organic matter diagenesis, preservation of biogenic carbonate and silica, and the cycling of metals. The chapter presents the energetics of organic carbon degradation through the progression of available oxidants, and includes factors that control respiration and preservation of organic carbon. There is an excellent discussion of kinetics and thermodynamics in sedimentary environments in the presentation on carbonate and silica cycling. The chapter closes with metal cycling in sediments. The discussion includes thermodynamic models of metal dynamics (e.g., the redox cycling of Fe and Mn) as well as conceptual models

based on empirical observations.

This book bridges the important gap between existing texts that assume a low level of chemistry background and those that stress chemical theory at the expense of oceanographic applications. The careful presentation of important oceanographic “problems” interspersed with the necessary review of pure chemistry, biology, and earth science makes this book appropriate for a very broad audience. It is a much-needed addition to the tools for teaching chemical oceanography at both the undergraduate and graduate levels. 

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Strait Through The Ice

A film by Yves Billy, Icarus Films, 2007, 52 minutes, \$390 US

REVIEWED BY JAMES P.M. SYVITSKI

Strait Through The Ice examines the geopolitical ramifications of the opening of the Northwest Passage due to global warming. The film offers viewers stunning vistas of this territory, as it follows the crew of the Canadian Coast Guard research icebreaker *Amundsen* through the Passage. A summertime, ice-free corridor would save the maritime industry some 4000 km on routes between Europe and Asia, primarily to Japan and China. Other economic

activities in the Canadian Arctic would also expand, as freight ships would become available to offload their cargos.

The film concentrates on Canadian experts, who offer their opinions as to why and how Canada wants to control this potential shipping traffic through its Arctic Archipelago. The Canadian government has recently stepped up its presence in the area through more intensive surveying and icebreaker operations.

The narration is presented in English, and most of the interviews with scientists, shipping executives, local residents, navigational workers, and military leaders are also in English. A few interviews conducted with French-speaking

sources are subtitled in English.

The film leaves much to be desired in terms of balance and information. Given how much of the discussion focuses on American opinions and claims that the Northwest Passage is an international navigable waterway, no Americans were interviewed, nor were representatives of other nations. This lack of balance is significant, particularly because, in 1957, American Coast Guard cutters were the first ships to sail the Northwest Passage using a deep draft route. Nowhere in the documentary was it mentioned that US submarines would commonly traffic the passage without any formal notification to the Canadian government. Nor

was it mentioned that both the United States and Russia operate submarines in the far north at reduced capacity today because of the redirection of their resources for other missions.

There are three potential northwest passages: (1) the McClintock Channel passage, (2) the Prince of Wales Strait, and (3) the M'Clure Strait. I am left puzzled that the film focuses solely on the McClintock Channel route, not even mentioning the other routes and their opening in a global-warming scenario. Both the McClintock Channel and the Prince of Wales passage have narrows that are less than 12 nautical miles across, and thus would be considered part of Canadian territorial waters. Only M'Clure Strait would qualify under international law of open passage, although global-warming scenarios show this area to be among the last to move from multi-year ice to more passable single-year ice.

I also observed, with humor, that one of the Canadian justifications for having the US cede control of the Passage to Canada rests on the potential of terrorists and their organizations to use it to move persons and material on vessels into North America. This scenario seems unlikely at best, considering the expense of building and operating an icebreaker. Since the end of the Cold War, the United States has ceded control of the security of the Arctic Archipelago back to Canada. The many American-operated Distant Early Warning Line sites there have been largely abandoned or turned over to Canada's Department of National Defence. Canada and the United States cooperate closely in this area, particularly through the renewal of NORAD (North American Aerospace Defense Command) in 2006.

Still, the film nicely covers the range of issues, albeit from a Canadian perspective. When I was conducting research in the Canadian Arctic in the 1980s, even operating in and around Baffin Island waters during summertime was a problem, and more than once we had to give up planned surveys, given the level of drift ice. Over the last quarter century, such complications have all but disappeared in that area, and soon possibly throughout the Archipelago. A new level

of opportunity is opening up, not just for local Inuit communities and maritime traffic passage, but also for scientific discoveries in Canada's far north. 

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