Chemistry and Biology of the Oceans

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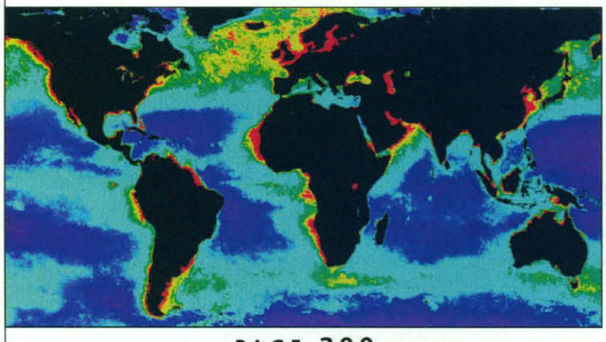
The oceans dominate the global cycling of many elements and are the ultimate sink for many pollutants. Carbon, nutrients, and many trace elements in turn fuel biological productivity in the oceans; thus, chemical and biological fluxes in the oceans are intimately linked. Both are subject to (and also may cause) changes in climate, which affects ocean circulation, weathering, gas exchange between the ocean and atmosphere, and the stability of ecosystems. This special issue of *Science* highlights efforts to understand these interactions at a variety of scales and their implications for ocean management.

Teasing out these interactions is a challenge, because they operate on global scales and require long-term experiments often done in remote and dangerous locations. But a global view is emerging, thanks to increasing satellite coverage, new techniques, and measurement campaigns. In this special section, several Articles and News stories explore the large-scale interactions between ocean biology and chemistry. (Additional coverage is provided in a Perspective and several Reports.) The authors focus on such topics as: how bioinorganic chemistry and the utilization of trace elements in marine organisms affects the cycling of these elements; how recent satellite data and high-quality monitoring allow a global assessment of primary production and a better view of carbon and nutrient cycling; and how long-term studies in the Pacific Ocean are giving insights into the effects of climate change on marine ecosystems and chemistry. Other authors tackle the ocean boundaries, where links between the biological and the chemical realms are pervasive but obscure: at sea floor ridges—hotbeds for novel life-forms—and in estuaries and coastal zones, the first destination of riverborne nutrients and pollutants. The latter is the focus of an Article and several News stories.



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Heightened awareness and availability of high-quality global data, as illustrated in this issue, have begun to reveal the extent to which humans have altered the biology and chemistry of the ocean. This increased awareness, and the recognition of many remaining uncertainties, prompted the United Nations to proclaim 1998 as the Year of the Ocean. As discussed in the Editorial and Viewpoint, current knowledge can guide international efforts to design and maintain adequate measurement networks and other research programs. Such advances will inform ocean management, a politically charged subject that has finally made it onto the international agenda.

–JULIA UPPENBRINK, BROOKS HANSON, RICHARD STONE

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