

Growing agenda

Daniel S. Greenberg

Ozone Diplomacy: New Directions in Safeguarding the Planet. By Richard Elliot Benedick. *Harvard University Press: 1991. Pp.300. Hbk: \$33.50, £22.25; Pbk: \$13.25, £8.75.*

SCIENCE and diplomacy became intimate in the postwar period, particularly in the quest for strategic arms control. The arms problem, though not resolved, is no longer as acute as it once was. But a relationship between the two professions is a durable necessity of our times. And the linkage has intensified with the recognition that environmental dangers transcend national borders and require multinational and often global efforts at control.

Richard Elliot Benedick, a career officer in the US Foreign Service, was at the centre of a historic event on this international front, negotiation of the 1987 worldwide agreement to limit and ultimately eliminate the production and emission of chlorofluorocarbons (CFCs) and other serious ozone-destroying chemicals. Benedick headed the US delegation in the lengthy, arduous and often hopeless-seeming negotiations that ultimately produced the Montreal Protocol on Substances that Deplete the Ozone Layer. Though the protocol's various loopholes and distant deadlines aroused various criticisms, it was nonetheless a landmark achievement of environmental foresight and commitment to action on a global scale. The serious threat posed by CFCs, reduction of the ozone shield against cancer-causing ultraviolet light, is not so immediate or direct as to set off popular alarms. Politics was deaf to scientific alarms in many countries. In environmental circles, Benedick is appreciated for helping keep his own government dedicated to the goal of CFC controls and for cultivating the international consensus that culminated in the agreement. In 1988, he received the Presidential Distinguished Service Award, the highest honour for career public service. But in the venerable tradition of the staff careerist, little is heard of author Benedick in his account of proceedings that stretched over several years of intricate dickering, rising and falling hopes and pragmatic compromises.

The negotiation of a pioneering international regulatory accord under the auspices of the anti-regulatory Reagan administration is surely a grand story of personalities, politics and scientific advice. But the Benedick version does not sing, let alone tell secrets. The author notes, for example, "While the US diplomatic efforts and the international negotiations were proceedings, anti-regulatory forces in the Reagan administration mounted a rearguard action in early 1987 to undermine the US position on protecting the ozone layer." Benedick states that

the last-minute resistance to ozone controls was justified on grounds that the US policy had not been cleared with several senior officials, including Reagan's science adviser, William Graham. Benedick states that "The reasons for this unexpected onslaught were uncertain." He speculates, however, that anti-regulatory forces had simply not been paying attention to the progress of negotiations. But one cannot help but suspect that the author knows more than he deems diplomatically appropriate for public discussion.

Although self-effacing, Benedick is generous to others in assigning credit for the successful outcome of the negotiations, especially to Mostafa Tolba, the executive director of the United Nations Environment Program (UNEP). Against a background of Third World suspicion of motives for pushing CFC curbs, and indifference among many industrialized nations, UNEP prodded and cajoled. Most important of all, the author states, the agency persisted in confronting the World community with the best available data, spotty as they sometimes were, and with forecasts of the fearsome risks of inaction.

Ozone Diplomacy is at its strongest in identifying the ingredients of the unprecedented agreement to eliminate CFCs. These are substances of great industrial, economic and social value, the chemical essence of the refrigerating and air conditioning that symbolize convenience and comfort in the rich nations and deprivation for the poor ones. Developing substitutes for these chemicals is proving to be a difficult task.

Benedick assigns the highest importance to generating scientific knowledge and conveying it to government officials. In working toward the ozone agreement, he states, "Scientists were drawn out of their laboratories and into the negotiating process, and they had to assume an unaccustomed and occasionally uncomfortable shared responsibility for the policy implications of their findings." In conjunction with scientific involvement, he continues, the political community had to support research and understand the findings and implications. The interplay between scientists and politicians was strongly influenced by the "power of knowledge and of public opinion," Benedick writes, pointing out that "A well-informed public was the prerequisite to mobilizing the will of governments and to weakening industry's resolve to defend the chemicals." Also of great importance, he found, was the presence of the multilateral UNEP, as both a forum for deliberations and prod to the participating nations. And he credits the role of national positions and leadership, noting that "The US government set the example by being the first to take regulatory action against the suspect chemicals." Nongovernment environmental organizations also played an important role in educating the public and promoting consensus, he states.

Though the 1987 Montreal timetables for CFC reductions were almost immediately

rendered obsolete by findings of an acceleration in ozone depletion, the diplomatic agreement embodied sufficient flexibility to provide for a speed-up in control production and use. But the latest findings, announced on 4 April, indicate that the ozone shield is diminishing at an even more alarming rate than was recorded just a year ago. Given the existing build-up of CFCs in the upper atmosphere, the cutbacks mandated by the Montreal agreement may come too late to prevent massive ecological damage.

Encumbered by listings of meetings and participants, *Ozone Diplomacy* is not a pleasurable text. But in mainly workmanlike prose, it records a critically important achievement in environmental cooperation. And it provides worthwhile insights on the harnessing of science and diplomacy, a partnership whose agenda is bound to grow. □

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Cross-channel traffic

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Channels, Carriers and Pumps: An Introduction to Membrane Transport. By Wilfred D. Stein. *Academic: 1990. Pp.326. £37.50, \$59.95.*

THE introduction in the 1970s of single-channel conductance measurements on black lipid films and of patch clamping of membranes provided the ability to follow the opening and closing of single ion channels and to study the gating process. This led to advances in understanding which were well summarized in B. Hille's book on ionic channels, (*Ion Channels and Excitable Membranes*, Sinauer, 1984). The more recent major advance on the structural side has been the cloning of a whole range of membrane proteins which, in their roles as channels, carriers and pumps, control the intracellular environment.

Channels, Carriers and Pumps can be welcomed as a bold and on-the-whole successful attempt to integrate the structural and functional approaches to the understanding of membrane transport and intercellular communication. It gives a balanced survey of a wide field and should help to counteract the tendency for workers on each system to ignore their neighbour's progress. To achieve this, Wilfred Stein has made extensive use of results from cloning, sequencing, expressing and mutating ion channels and transport proteins to emphasize relationships between many of these systems at the molecular level. The cloning procedures are outlined and many of the sequences and their probable transmembrane distributions are shown. Although the structures are not yet