SETAC PRESS

Environmental Toxicology and Chemistry, Vol. 23, No. 10, pp. 2279–2280, 2004

Printed in the USA
0730-7268/04 $12.00 + .00

Special Issue Honoring Don Mackay

Editorial

A WORLD MODEL, A MODEL WORLD

The title tells much about the man and his work. Trained in Glasgow, Scotland and recruited by the University of Toronto and later Trent University in Canada, Don Mackay has been a source of inspiration for those interested and involved in the behavior and effects of chemical substances in the environment. His students know him as the professor who motivated them to fight oil spills or seek out chemicals with environmentally friendly properties, and who encouraged their computer-oriented minds to develop models for better stewardship of the environment. His colleagues know him for his unique ability to describe complex processes by simple concepts and models.

As one of the founding members of the Society for Environmental Toxicology and Chemistry, he has played a key role in establishing a new discipline devoted to the fate of chemicals in the environment. His tireless efforts to champion the ''fugacity approach''—documented first in an article in *Environmental Science & Technology* entitled ''Finding Fugacity Feasible'' [1] and followed by dozens of publications and a book—have laid the theoretical foundation for much of the discipline of environmental chemistry devoted to the fate of chemical substances in the environment. This work has helped to elevate the discipline of environmental toxicology and chemistry to a level of maturity and respect.

Regulatory bodies in Canada, the United States, and Europe have followed his lead and now sport fast-computing fugacity models and lengthy chemical property data bases that support regulatory activities relating to the evaluation of new chemical substances and the assessment of exposure to chemical pollutants. Don's message concerning the need to scrutinize the environmental behavior of chemical compounds has also been taken to heart by chemical manufacturers. Several chemical producing companies now actively support Don's current research chair in Environmental Modelling at Trent University in cooperation with the Natural Sciences and Engineering Research Council of Canada. Every year the Canadian Centre for Environmental Modeling that Don founded at Trent University attracts many individuals from industry, government, and academia to discuss current issues modeling the fate of chemicals in the environment.

His numerous contributions to public life, recently recognized by the Order of Canada and the Order of Ontario, further stand as a remarkable example and proof that good ideas, hard work, and passion can make a difference in the world.

Don's work is about his life-long dream to build a mathematical model of the fate of chemical pollutants in our world. Such a model is of great value and importance, because it can be used to forecast where chemical products such as electrical fluids, plasticizers, fire retardants, gasoline products, and the thousands of other chemicals that our society produces will go after they are used. Our current knowledge of chemical compounds such as DDT, polychlorinated biphenyls, and dioxins have taught us that inconsiderate use, production, and discharge of chemicals can threaten life on our planet. We also know now that chemicals can make amazing journeys and end up in places that are worlds away from their location of origin or release into the environment. It is therefore imperative that the fate and effects of chemicals be anticipated. Preferably, this is done even before the chemical is ever synthesized, so that any possible adverse effects of the chemical in the environment can never materialize. Ideally, this is also done on a global basis, because every source of chemical on our planet contributes to the chemical burden at every place on our planet.

To accomplish his dream of a model world, Don has worked tirelessly to build chemical fate models. He started with the relatively simple level I, II, III and IV fugacity models for chemicals in evaluative worlds. These models were followed by models by Lake Ontario, the Bay of Quinte, and several other ecosystems, and evolved into bigger and BETR models, such as the BETR model for North America, the model for the and assessments of the global fractionation of semivolatile substances. The unique quality that Don brings to his quest is his ability to quickly immerse himself in many aspects of chemical distribution, which typically are dealt with by several scientific disciplines, and quickly grasp the essential concepts and information relevant to the fate of chemical pollutants. It is quite remarkable that not only did he learn from so many disciplines, he also contributed key new ideas to each of these areas, and in the process plotted new research directions. Good examples are his contributions to air–water distribution of chemicals, theories on sorption of organics to sediments and soils, models of bioaccumulation in fish and plants, toxic body burdens, global atmospheric distribution, passive samplers, and methods of cleaning up oil spills. It is this Mackay quality that is unique and the reason for celebration in this special issue of *Environmental Toxicology and Chemistry.* It has led to many innovations in research and solutions to environmental problems, and it is guiding the thinking and work of many environmental chemists and toxicologists around the world today.

In recognition of Don's many gifts to the environmental chemistry and toxicology community, it is fitting that those of us who have been involved in Don's life work celebrate his contributions with a series of studies that further contribute to building the world model of Don's dreams. This issue contains a series of articles relating to themes that have received the interest and contributions of Don Mackay. They include articles on physical–chemical and environmental properties of a range of organic substances. Several articles discuss the development, testing, and application of environmental fate models at various spatial scales, and deal with various materials including pesticides, persistent organic pollutants, and oil. An-

other interest of Don Mackay is bioaccumulation. For this reason, several articles are devoted to the mechanisms of the bioaccumulation process and models for predicting the bioaccumulative behavior of organic substances in the natural world. Finally, to conclude the ''long and winding'' journey from the physical–chemical properties of chemicals and their toxicological characteristics in nature that Don likes to talk about so much, two papers address the toxicological properties of organic chemicals and their application to environmental quality management. This issue also contains the insights of Don Mackay himself. In an article entitled ''Finding Fugacity Feasible, Fruitful, and Fun,'' he discusses the history and the future of the discipline of environmental chemistry and toxicology. The editors believe that this issue of *Environmental Toxicology and Chemistry* stands as a testament for the incredible progress that has been made by so many of us in the search for the ecological significance of chemical substances in the environment since the publication of that elegant and unique paper entitled ''Finding Fugacity Feasible.'' There is little doubt that ''Finding Fugacity Feasible'' has been fruitful and fun for many of us. Thanks, Don.

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