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Environmental pollutants subject of Morris Katz Memorial Lecture

Environmental pollutants are often in the news, and current research is showing what happens when they interact. Sometimes the discoveries are surprising.

Right: Nigel Bunce

This is what a University of Guelph professor will be discussing at the 2004 Morris Katz Memorial Lecture in Environmental Research, to be held at York on Friday, June 11, at 1:30pm.

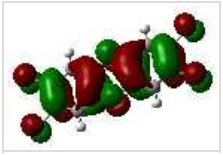
Nigel Bunce, professor of chemistry and toxicology at the University of Guelph, will present his talk, "Environmental chemistry and toxicology of halogenated aromatic compounds", in the Senate Chamber, N940 Ross Building.

York's Centre for Atmospheric Chemistry is a major contributor to this year's lecture, along with the Ontario Ministry of the Environment.

The compounds Bunce examines include dioxins known as PCCDs (found in minute quantities, mainly as a result of certain combustion processes) and PCBs (formerly used as insulating fluids in electrical transformers). There is also an emerging group of halogenated aromatic compounds called polybrominated diphenyl ethers (PBDEs), which are used as flame-retardants in applications such as foam cushions and electronic equipment. It is the PBDEs which Bunce and his students have been studying most recently.

"These compounds are noted for their persistence in the environment, the ease of which they can be taken up and stored by living organisms, their ability to transport to and deposit in polar regions, and their potential for toxicity to both human beings and wildlife," explained Bunce.

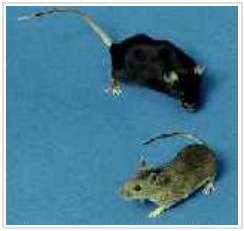
Below, right: A model of TCDD



"Our research group is particularly concerned with the ability of halogenated aromatic compounds to exhibit dioxin-like properties – toxic properties similar to those in the notorious compound popularly called 'dioxin', whose full name is actually 2, 3, 4, 8-tetrachlorodibenzo-p-dioxin – TCDD for short," Bunce added.

"The toxic properties of TCDD are very controversial because not all species respond the same way to them. Human beings, for example, appear to be much less responsive to TCDD than many laboratory animals."

Because halogenated aromatic compounds virtually always occur in the environment as complex mixtures, the question arises as to what happens when their mixtures interact. "We know that some of these compounds antagonize the action of one another," said Bunce. "There is a famous example that was discovered some 15 years ago by Steve Safe, a Canadian scientist now working at Texas A & M University, which showed that PCBs can inhibit



the ability of TCDD to cause birth defects in mice."

In his talk, Bunce plans to discuss two related issues that his lab team has worked on. First, he will delve into the question of the interactive effect of mixtures. "We have attempted to follow, step-by-step, the mechanism of action of TCDD to one of its end-points – the induction of a certain enzyme, known as cytochrome P-450 1A1," he said, "and ask whether or not antagonism by PCBs occurs at that particular step.

"Second, we have studied the emerging group of flame-retardant compounds – PBDEs – to ascertain whether this group of substances is likely to pose a threat on the basis of dioxin-like toxicity. We already have that answer, and it is 'no'."

About Nigel Bunce

Educated at Oxford University in England, Nigel Bunce has been teaching in Canada since 1967, at the University of Guelph since 1969. He was coordinator of the University of Guelph's Toxicology Program from 1989 to 2002. Bunce has been active in environmental research for over 25 years, including environmental photochemistry and the environmental toxicology of halogenated aromatic compounds. His most recent research involves electrochemical methods for the remediation of recalcitrant aqueous wastes.

Bunce has received a number of honours, including the ESTAC (Environmental Science and Technology Alliance of Canada) Award for Meritorious Research in 1999, Union Carbide Award in Chemical Education in 1992 and Ontario Confederation of Faculty Associations Teaching Award in 1991. In addition, he was made a Fellow of the Chemical Institute of Canada in 1992. Most recently, his research paper on the application of Haber's Law of inhalation toxicology, was deemed "Human Risk Assessment Paper of the Year 2003" in the journal, *Human and Ecological Risk Assessment*.

A member of numerous professional associations, Bunce was involved in 1998 in the Curriculum Team for Ontario redesign of high-school science, with responsibility for chemistry, for implementation in the four-year high school program. He sits on the editorial board for the journal, *Environmental Toxicology*, and from 1971 to 2001, he was on the editorial board of *Crucible*, the magazine of the Science Teachers' Association of Ontario.

About Morris Katz

Morris Katz, 1901-1987, was an outstanding scientist. He spent 35 years in public service, where he pioneered air pollutant sampling and measurement methodology and was among the first to demonstrate the presence of ozone damage to vegetation in Ontario. He taught chemistry at York until his death. He authored or co-authored more than 150 books and articles and was the recipient of numerous awards for his work. The Morris Katz Lectureship was made possible by the establishment of an Endowment Fund created through contributions from his family, friends and colleagues, private companies, universities and government.

Bunce on Katz

"When I was asked to speak at this lecture series, I read details about Morris Katz' career, and what struck me most forcefully was his wide range of interest in environmental issues, at a time when few scientists were involved in environmental research," said Bunce. "It's a wonderful tribute that Dr. Katz's friends and colleagues have kept this lectureship going in his honour. But perhaps equally important is the fact that recent Katz lectures have been about environmental issues that go beyond the study of air pollutants, which was Katz's principal concern.

“For this reason, I hope to make my own presentation accessible beyond a narrow audience: It is not my intention to focus on only the details of work from our own laboratory.”

About York’s Centre for Atmospheric Chemistry

York’s Centre for Atmospheric Chemistry was established in 1985 in response to a growing public concern about the atmospheric environment. It offers an undergraduate degree program that provides students with the necessary theoretical background and practical laboratory experience to enable them to make meaningful contributions to important environmental concerns upon their graduation. York also offers MSc and PhD degrees in atmospheric chemistry.

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