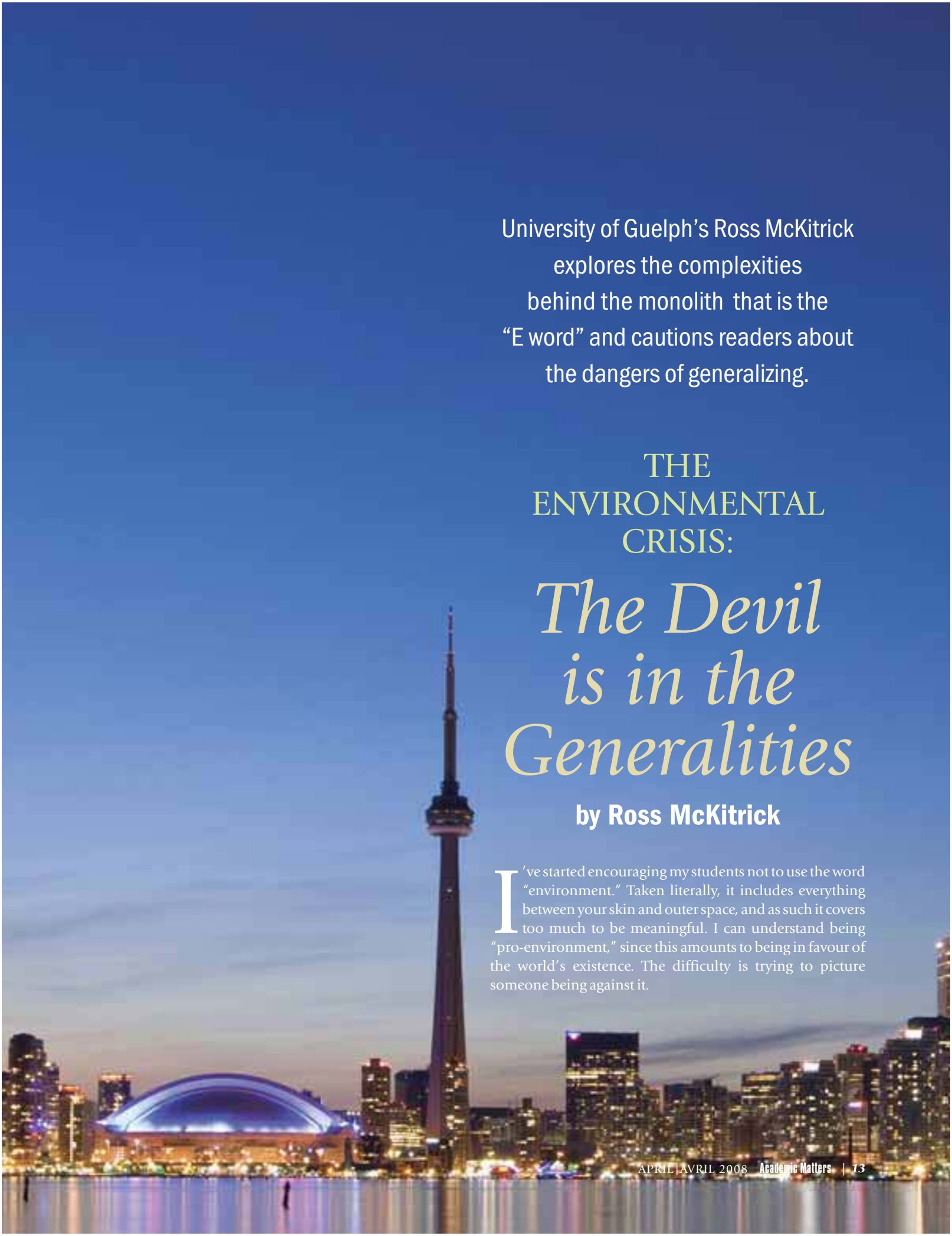

University of Guelph's Ross McKitrick explores the complexities behind the monolith that is the "E word" and cautions readers about the dangers of generalizing.

THE ENVIRONMENTAL CRISIS: *The Devil is in the Generalities*

by Ross McKitrick

I've started encouraging my students not to use the word "environment." Taken literally, it includes everything between your skin and outer space, and as such it covers too much to be meaningful. I can understand being "pro-environment," since this amounts to being in favour of the world's existence. The difficulty is trying to picture someone being against it.

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But these days when people say they are "pro-environment" they typically have something more specific in mind. With so much anxiety on the subject, and so many public policy decisions influenced by that anxiety, it is important to try to clarify those specifics. In this respect, common usage of the term "environment" seems to me to create two problems.

First, using the general word "environment," instead of more specific terms, tends to detach any ensuing discussion from the prospect of measurement with real data. We can measure specific types of pollution, biological conditions, resource scarcity, etc. But there is no way to measure the "environment" as a whole.

At a minimum, we ought to distinguish between air, water and land-related issues. But even within these categories the sub-distinctions are large and important. Consider air pollution, for example. If we start with the question of whether air quality in your region is getting better or worse, we soon run into the complexity that it is not one thing, but many different things. There are hundreds of air pollutants addressed by contemporary regulation. Some are gases, some are particles, some are aerosols. Some are emitted, some are formed by chemical reactions involving ambient levels of precursor compounds. Some are toxic, some are not. Some are more prevalent in cities, some in rural areas. Some are affected by meteorological conditions, some are not. All these distinctions matter when trying to characterize the issue.

Each year, my students' first assignment is to get long term air pollution data from Environment Canada for the city (or, if available, the neighbourhood) in which they grew up, and write a report on how air quality, as represented by the major contaminant species, has changed since they were born. Most are surprised to see how much it has improved (and if I had asked them to go back to 1970s data they would have seen even larger improvements). In the mid-1960s, sulphur dioxide levels in downtown Toronto averaged over 100 parts per billion. Today they average less than five parts per billion. The effective disappearance of sulphur from urban air is a common pattern in Canadian data. But not all contaminants have gone down. Compared to the early 1980s, ground-level ozone has risen, though the number and intensity of summertime peaks has tended to diminish in some places.

If we ask whether air pollution has gotten worse, the answer is "it depends." Many air pollutants have been reduced. If we focus on ozone and ask how it should be reduced further, the distinction between emitted and precursor-based pollutants comes into play. Ground-level ozone is not emitted, it is the result of complex chemical reactions between nitrogen oxides and volatile organic compounds, each of which comes from both human and natural sources. Depending on meteorological conditions and the current concentrations of these precursor gases, a decrease in, say, nitrogen dioxide, might lower the ambient ozone level, but it might also raise it. Or it might lower it locally but cause it to increase in a downwind region.

I saw a vivid example of the disconnect between perception and measurement last year, when I heard a well-known Canadian newspaper columnist give a keynote address to a conference of economists. He expressed his hope that the federal government would soon move to regulate air pollution. He grew up in rural Ontario, he said, in a place where there never used to be smog warnings. But in recent years, air quality in Ontario had become intolerable. There have been smog warnings even in his home town, he said, and there was even one in winter a few years ago. He was dismayed that governments had allowed air pollution to be unregulated for so long, and he called on the federal government to take action.

I introduced myself to him after his talk. I explained that he did not recall any so-called "smog warnings" (actually Air Quality Advisories) from his youth because the system did not exist back then, but smog certainly did. The Air Quality

Index was only introduced in 1992, and in late 2002 the formula was revised so that it is triggered under broader conditions. That is why we recently had our "first ever" winter smog warning. But actual air pollution levels have gone down across Ontario, even in Toronto. If the current smog warning system had existed in the 1960s, there would have been alerts all year round; they would seem remarkably infrequent today, by comparison. I also explained that air pollution has been subject to provincial regulation for decades, and is not under federal jurisdiction.

He was taken aback by all this, and said he would like to write a column about it. Later I emailed some information sources to him, but by then he had moved to a new assignment and wasn't able to write further on this issue. What struck me at the time was that this was a well-educated national journalist, whose job requires him to be informed about major policy issues, who was giving a prepared speech on a topic of obvious personal concern to him, before a conference of professionals, and yet when he stood up to speak, what he had to say was completely wrong on points that are easy, with minimal effort, to look up.

That is, in a nutshell, my first concern about the word "environment." Academics tell their students to "look it up." But this requires a habit of thinking about specifics. You can't "look up" the state of the environment. You can look up specific aspects of it: air pollution, water pollution, forest cover, land use patterns, resource stocks, species populations, and so forth. But if the conversation treats the environment as a single, abstract whole, we lose the ability to guide our thinking with the tools of measurement, experimentation, modeling and hypothesis testing.

My second concern about the E-word follows from the first. In the absence of specific measurement, or even agreement on what we ought to be measuring, the discussion too readily seems to get framed in the language of crisis. I grew up hearing about the environmental crisis. Twenty years ago I decided to specialize in environmental economics after hearing more and more about the environmental crisis. But in the intervening years I have found that the perception of crisis is often inversely proportional to the specificity of the discussion.

The intellectual pilgrimage of Danish academic and author Bjorn Lomborg is well known in this respect. Lomborg was annoyed upon hearing an American economist (Julian Simon) claim that the state of the world was improving. To debunk the claim, he waded into detailed examination of specific data, and ended up conceding the argument by way of his bestseller, *The Skeptical Environmentalist*. My own pilgrimage has similar elements. In 1999, as part of a research project I was starting, I contacted the Ontario Ministry of the Environment to obtain some historical air and water pollution data. I got the data, graphed it, and my assumptions about pollution trends promptly fell to pieces. It forced me to wonder why I carried those assumptions for so many years without ever looking up the underlying information.

Back then I taught a second-year course called "Economic Growth and Environmental Quality," a popular elective with environmental science majors. Rather than begin with a load of economic theory, I would start by showing my collection of data on air and water pollution, with many of the series plotted against measures of local real income. In most cases (though by no means all), greater wealth and income seems to accompany lower pollution levels. This would immediately raise questions about how economic growth could accompany environmental improvement, thereby motivating interest in the main content of the course.

One year an environmental science student challenged me over the data I was showing. He was convinced that I was cherry-picking. So I invited him to go to the library and find all the data he could, and I promised to show anything he wanted to the class. He arrived in my office the next day convinced that he had found data refuting the general pattern that wealthy countries were cleaner. When he showed me the graph, I pointed out that the axis measured water *quality*, not pollution, and the implication was the opposite of what he thought.

At this point he slumped in the chair with a mystified look. He said that on his first day of class four years earlier, the professor had told them "The environment is in worse shape now than it was ten minutes ago, and ten minutes from now

it will be even worse. It is up to you to stop this." Since then he had been filled with a great sense of purpose and excitement, but somehow he hadn't actually looked at much data. Now that he was, for the first time, seeing measurements of the things he had been talking about for years, the picture was not what he expected it to be.

It has become a commonplace to refer to the "environmental crisis." But I find the crisis rather hard to locate. On specific issues there is a continuum, ranging from non-issues, situations of concern, problems, and onward up to actual crises. Not everything is a crisis, just as not everything is a non-issue. Things mostly fall in between. But to see this requires leaving aside the concept of the environment as a single abstract whole, and going into specifics.

Let me take the highly contentious topic of global warming as an example. Al Gore referred to it as a "planetary emergency" in his testimony before Congress last year. Similar language in the media and among politicians is now ubiquitous. A couple of years ago, knowing that I was involved in debates about this, a colleague expressed to me his exasperation at the seemingly intractable disputes. Surely, he reasoned, there must be agreement by now about what the issue is, and how to measure it, and at that point we should be able to look at the data and decide.

This is the right way to approach the issue. Here is my suggestion about measurement. A little-noticed message from last year's report of the UN Intergovernmental Panel on Climate Change (IPCC), echoing Report 1.1 from the United States Climate Change Science Program (CCSP) in April 2006, is that if greenhouse gases are driving climate change, there will be a specific pattern to it. The warming will be at a maximum in the tropical troposphere, which is the region of the atmosphere from one kilometer up to about 16 km above the surface, between thirty degrees North and South of the equator. Model "back-casts," or simulations of the 20th century evolution of the atmosphere, indicate that this warming pattern should be running at about double the surface warming rate, it only arises from greenhouse gases, and it ought to be observable already (I am referring here to Figure 9.1 of Volume 1 of the IPCC Report, and Figure 1.3 of the CCSP report.) Model projections of 21st century greenhouse warming all show that it will reach a maximum in the tropical troposphere, and that the effect occurs rapidly in response to greenhouse gas accumulation (IPCC Volume 1 Figure 10.7, discussed on pages 763—764).

Since the tropics accounts for half the world's atmosphere, and since the model consensus points to a rapid response to greenhouse gases in the tropical troposphere, and furthermore that this is where the maximum greenhouse warming is expected, the data for this region seems to me to be a good candidate for measuring an upper bound on human-induced global warming. There are two teams (one at the University of Alabama-Huntsville and one at Remote Sensing Systems in California) that use weather satellite data to produce measures of the average temperature for the tropical troposphere. Both teams report a small upward trend for this region (0.18 degrees C per decade) since 1979, just below the low end of the forecast range in the recent IPCC report.

To my mind, this trend is not indicative of a crisis. Indeed, the CCSP report drew attention to the tropical data, pointing out that "the models that show best agreement with the observations are those that have the lowest (and probably unrealistic) amounts of warming" (p. 11). Leaving aside the bracketed gloss—though it is interesting to ask how models showing the best fit to the data but the least fit to modelers' prior beliefs are deemed unrealistic—I take this to mean that the current data does not validate the mid-range or upper-range of the warming projections, and at the moment our attention should be on the low end of the forecast range.

But things might change. As a policy idea, I have proposed that governments ought to consider implementing a tax on carbon dioxide emissions, with the growth of the tax tied to the trend in the temperature data from the tropical troposphere. At the upper end of the IPCC projections the tax would go up fast enough to bring about aggressive emission reductions, while at the low end the tax would only slowly curtail some emitting activity. In other words, the atmosphere's revealed sensitivity to carbon dioxide emissions would determine how aggressive the policy would be, and all parties to the debate would thereby expect to get their

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preferred outcome. Since markets are forward-looking, investors would start building expectations of future climate change into current investment plans, and this would put a market premium on the best climate forecasting techniques.

I have spoken to numerous audiences about this idea over the past year, and I am often struck how people who would consider themselves to be deeply interested in global warming are unaware of the specific issues surrounding the tropical troposphere. As a generalized concept, global warming evokes great fascination and anxiety. Crisis language has become so cliché that politicians have to reach for ever more lurid analogies to prove their concern, such as Al Gore likening it to a baby in a crib that has caught fire. But go into the specifics, and the hyperbole seems to become more and more misplaced. This is not to say that the whole thing is a non-issue, but that proper assessment of the nature of the problem can only begin when the discussion departs from vague generalities and gets into specific phenomena that can be measured with good quality data and rigorous empirical analysis.

At many Canadian universities, not to mention in society as a whole, the "environment" has now become one of the top organizing themes for new policies and directions. Perhaps much good will come of this. But the intellectual duties we face at this moment would become clearer if use of the term "environment" gave way to a new habit of referring to specific topics, beginning with agreement about what we are actually trying to measure, and leaving aside any prior assumption that the whole thing is in crisis. AM

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