Rescuing Venice from a Watery Grave

WE ARE SADDENED THAT MISINFORMATION is paralyzing and confusing decision-makers while Venice continues to suffer from the threat of serious flooding.

There is nothing new in the estimate of 13 cm/century of relative sea level rise (RSL) presented by A. J. Ammerman and C. E. McClennen in their Policy Forum "Saving Venice" (25 Aug., p. 1301). The Environmental Impact Statement (EIS) of the proposed gates to protect the Venice lagoon against flooding (MOSE, Modulo Sperimentale Elettromeccanico, or experimental electromechanical module) used 100 years of data in Venice and in Trieste to project an RSL rise of 20 cm over the next 100 years (*1*). This result was corroborated in an independent study by Italian researchers (*2*). Under this scenario, gate closure would occur ~40 times a year and a typical closure would last for 4 hours, or ~2% of the time. Even for an extreme 12-hour closure, there is no significant impact on the water quality or circulation of the lagoon. Furthermore, it is suggested that an RSL rise of 30 cm is a more accurate assumption. The EIS included this scenario, indicating that the tidal gates would have to operate more frequently for short time periods. Reduction in tidal circulation in the lagoon would be mitigated by properly operating the gates. However, the water quality and ecological problems of the lagoon will only be resolved by proper management of waste inputs.

Ammerman and McClennen mention that the Ministry of the Environment, in a December 1998 decree, opposed the gates project (*3*). They fail to mention that the Veneto Region Administrative Court invalidated that decree on scientific and legal grounds last July (2000) (*4*). The project has been endorsed by the Region of Veneto, the municipality of Chioggia, the European Parliament, international experts advising the Prime Minister, the staff of the Ministry of Culture, and the independent experts who supervised the EIS. The signatories were members of that group.

Venice is indeed in peril and the only solution is to separate the Adriatic from the lagoon during periods of high meteorological tides. The proposed movable gates will protect the whole lagoon against any reasonable scenario for at least half a century, even if we assume unprecedented sea level rise due to global warming. The decision-makers should follow the examples in the Netherlands and London in protecting against flooding before it is too late.

A barge floats past some of the impressive buildings along the Grand Canal in Venice.

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Response

ONE OF THE PRIMARY AIMS OF OUR ARTICLE was to draw attention to the limitations of the scientific analysis in the three published reports (*1*–*3*) that form the official basis for the evaluation of the environmental impact of the proposed project. So far, the Council of Ministers of the Italian government has taken no decision on the approval of funds to go ahead and have the Consorzio draw up an executive plan as the first step toward the implementation of MOSE.

The claim that the historical trend in the rise in RSL at Venice (an average of 13 cm/century between A.D. 400 and 1900) was well known before our article in *Antiquity* (*4*) is incorrect. For example, the Collegio (*2*), in the introduction to its report (published in July, 1998), notes that the historical trend in RSL is not well documented in Venice. If this value (13 cm/century) had been well known at the time, the choice of the low scenario (forecasting a rise of only 4.4 cm in RSL at Venice over the next 100 years) adopted in all three reports would have made even less sense. Furthermore, the value of 30 cm that we propose as the new low projection for the rise in RSL by 2100 is not an assumption, as Bras *et al.* claim. It is based on a scientific argument: the historical trend for Venice taken together with a minimal allowance for the effect of global warming and a small margin of safety.

We did not mention the decree of the Minister of the Environment (co-signed by the Minister of Culture)—something quite different from the report by the national committee of the Ministry of the Environment (*3*)—in our article, since this is a matter that remains unresolved. We should point

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted by e-mail (science_letters@aaas.org), the Web (www.letter2science.org), or regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

out that Bras *et al.* mention only selected opinions in favor of the proposed project. One could equally cite opinions against the project, such as those of the Italia Nostra (the main heritage organization in Italy), the WWF, and other environmental organizations in Italy. Locally, a working group commissioned by the Venice City Council found the environmental impact study prepared by the Consorzio (*1*) to be seriously flawed (*5*). Presently, there is no consensus about the merits of the proposed gates.

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3. *Interventi alle bocche lagunari per la regolazione dei flussi di marea* (Ministry of the Environment, Rome, 1998).
4. A. J. Ammerman *et al.*, *Antiquity* **73**, 303 (1999).
5. *Opinion of the Working Group on the Environmental Impact Study On the Preliminary Design for Tidal Flow Control Barriers at the Lagoon Inlets* (Venice City Council, Venice, 1997), pp. 1–41.

Ethical Behavior as a Stakes Game

WHEN READING "HOW PREVALENT IS FRAUD? That's a million-dollar question" by Eliot Marshall (News of the Week, 1 Dec., p. 1662), I was stunned to find that researchers and policy-makers seem to consider fraud in original research to be the same as or at least on par with undergraduate student cheating in science laboratory courses. I think many faculty who teach at predominantly undergraduate institutions would consider the two to be entirely different phenomena.

The Office of Research Integrity within the U.S. Department of Health and Human Services, according to the article, was about to spend $1 million "to investigate the prevalence of fraud, data fabrication, plagiarism, and other questionable practices in science." Surely this money will not be wasted on studying whether undergraduates—particularly freshmen in required science classes—cheat. They do. Marshall mentions a study at Arizona State University by Elizabeth Davidson that supports my statement, in which more than 80% of students in basic biology and zoology courses admitted to manipulating data to get a higher grade. I have even known students to admit to data manipulation to defend their arguments about why they feel they deserve a better grade. For example, a student in a freshman-level chemistry lab e-mailed me, after finding I had awarded him zeros for handing in labs that had data totally different from his lab notebook: "I knew my data was way off for most of my labs, so I used data that I knew would be more accurate, that's all."

Ownership of the results of research is at the heart of the matter and is the main reason why undergraduate cheating is common, whereas data manipulation in true, original science research remains, I hope, very rare. Undergraduate students, particularly freshmen, don't care about ownership of their results—they just want a grade, as Davidson also suggests. They consider the lab and any results they obtain merely one more ticket to punch on their road to something else. Honor codes and expulsions for cheating no longer exist at all but a handful of universities, for a variety of reasons including fear of litigation, the desire to retain paying students, or the belief that a single infraction is not serious enough to warrant expulsion, so students have little fear of serious reprisal.

"There are some noble battles that people must fight, even if it is known beforehand they will be defeated. This is one such battle."

The attempted remedy that Marshall mentions—namely, a course on science ethics—can also be viewed as money wasted. One course, encompassing perhaps 40 hours of contact time and twice that in independent study, will not change the attitudes about required classes and labs learned in the first two decades of a person's life. However, unlike my criticism of spending $1 million to investigate scientific fraud that might encompass undergraduate cheating, I maintain that ethics classes should still be taught even if it might be money wasted. We must try to show our students what is ethical in a variety of situations, even if we suspect it will have little effect, as some research mentioned in the article indicates. There are some noble battles that people must fight, even if it is known beforehand they will be defeated. This is one such battle.

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In a Map for Human Life, Count the Microbes, Too

THE COMPLETION OF THE HUMAN GENOME sequence is, without question, a crowning achievement in biology. The commemorative issues of *Science,* 16 February, and *Nature*, 15 February, provide superb chronicles of this event and I, for one, will keep them as mementos of the occasion. However, accompanying articles with statements such as "the blueprint for human life" seem somewhat exaggerated.

"Our existence is...dependent on...bacterial species...living in and on us"

I would like to point out that we depend on more than the activity of some 30,000 genes encoded in the human genome. Our existence is critically dependent on the presence of upwards of 1000 bacterial species (the exact number is unknown because many are uncultivable) living in and on us; the oral cavity and gastrointestinal tracts contain particularly rich and active populations. Thus, if truth be known, human life depends on an additional 2 to 4 million genes, mostly uncharacterized. Until the synergistic activities between humans (and other animals) with their obligatory commensals has been elucidated, an understanding of human biology will remain incomplete.

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Defining Distress

DISTRESS—"A STATE IN WHICH AN ANIMAL cannot escape from or adapt to the internal or external stressors or conditions it experiences, resulting in negative effects on its well-being." This working definition, drafted by the Animal and Plant Health Inspection Service (APHIS), is under consideration by the U.S. Department of Agriculture (USDA). But, according to a letter to USDA from the Federation of American Societies for Experimental Biology, this definition of stress is "vague and could lead to widely varying, highly subjective interpretations" (News of the Week, 24 Nov., p. 1474).