June 7, 1995

Dr. Buzz Hoagland  
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Department of Biology  
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Dear Dr. Hoagland:

I have tried to reach you about your kind invitation to be the keynote speaker at the Association of Midwest College Biology Teachers (AMCBT) meeting on September 29. I do have that date open, and I would be happy to speak, but I think I should decline for two simple reasons.

The first reason is that I am not really a distinguished teacher of biology. Although I loved being a graduate teaching assistant in cell biology, most of my experience with education is from the point of view of a student—perhaps not a very good one at that. I did not like biology; the birds and the bees put me to sleep. Ecology and evolution were the only macrobiologies in which I could stay awake. My subjects were physics, chemistry, and biochemistry, and begrudgingly in later life, genetics.

The second reason I should decline is that I am turning into a curmudgeon, believing now that technology is education's enemy, and that students should learn the hard-core disciplines in science like mathematics, thermodynamics, logic, and mechanics and, in social science, economics and history. I see ignorance everywhere floating in a sea of information, most of it so poorly presented that it robs the listener of his power to reason and reflect. Water water everywhere but not a drop to drink!

Knowledge, as opposed to information, is assembled not accumulated. Like the stones of a great building, everything learned must be shaped by reflection and then laid upon the edifice in sequence, while the whole assembly rests on a bedrock of understanding. Politics, technology, information, ideology, religion, enthusiasms of every kind—these are the enemies of knowledge.

Science students should bring some knowledge of mathematics and language to college. On arrival they should turn off the TV, shut down the computer, and develop a sense of scale from physics and chemistry. What are the fundamental units? What is mass, velocity, energy, inertia, momentum, and work? What forces are known? What is the relationship between internal energy, pressure, volume and temperature? What is the periodicity of the elements and where do the isotopes come from? What is the nature of the particles? How big is the universe and what is it made of? What does it weigh? How long has it been here? Where is it going? Which quantity is greater, the mass-energy of the stuff in the universe or the gravitational potential of its distribution? What reactions power the sun? Lay this knowledge in the foundation if you would be a scientist.

Students should read some biology. What is metabolism? How did life get started on this planet? What are the species and why are they so diverse? What is the basis of inheritance? Are all living things related? What are the materials of life and how do they pool and cycle through the biosphere? What conditions are necessary to life? Is the biosphere stable?
Civilization cannot survive without a knowledge of history. What is feudalism and what changed to allow the rise of industrial capitalism? What are nations and why are they so persistent and compelling? What is religion and what is its role in history? How did this nation come to separate its civil and religious affairs? What are the causes of war and peace? What is totalitarianism and why was it so important in this century? What is property?

Students should also have to learn some economics. What is money? What are savings and what is capital? How is wealth generated? What is trade? What is the relationship between unemployment, interest rates, inflation, wages, and the value of a currency? How are savings, investment, and the current account related? How does government spending affect investment, savings and aggregate demand? What is the relationship between risk and return in a well-functioning market? What is known about the distribution of wealth?

If a student must learn about information, let him learn some information theory. How is the rate of information transmission limited by bandwidth? How are waves represented with numbers and numbers with waves? What does it mean to compress information? How do you represent a real number? How is prior knowledge of a data structure related to the amount of information that must be stored in it?

All these things are known and should be taught.

But the serious student will spend his whole life struggling with questions of ultimate meaning. Who are we? How did we get here? Why does it appear that the particular is orderly while the general is chaotic? What is the relationship between what we know and what we believe? Can we control our destiny? How can we know good from evil? Why do we love and hate? What will be left to posterity from this time? What responsibility do we have to the future? Will anything at all about human civilization survive on a geological time scale? What is God?

The answers to questions like these are not known; indeed the answers are not the stuff of knowledge. Educators cannot teach these things except to show respect for their importance. But students, as they walk through life, will find these deeper questions daunting without some knowledge and without some appreciation for the disciplines that have brought humanity to this junction. Instilling this knowledge and appreciation is the principal mission of education.

Now to the subject at hand. Computers are not a legitimate academic discipline any more than cars or bicycles. There is no such thing as computer science. There is an engineering discipline for people who would build or program computers and there are a few branches of mathematics that assist those interested in algorithms. But, how to use computers, how to store and retrieve data from them, how to find resources on Internet—these are best learned in the context of a pressing application.

Access to computers will not help students learn anything of importance. Important things are learned from teachers in the classroom and from books in the study. Armed with knowledge and the power to learn, students can stand against the wind and slowly make their way, and with God’s grace, help others to follow.

I do appreciate the invitation, but as you can see, my views are out of fashion on the subject of technology in the classroom.

Sincerely,
John Devereux, Ph.D., President, Genetics Computer Group

**Editor’s Note: Despite his initial refusal, Dr. Devereaux presented his opinions in the keynote address to the 1995 AMCBT annual Meeting.**