

Introduction

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For almost a decade we have held a meeting of the Fermilab Industrial Affiliates as spring bursts over Fermilab and the Fox Valley. Central to that annual night is a Roundtable on a weighty issue. This year was no different. Our subject was "The Science-Technology Spiral and the Pace of Progress." Numbered among our speakers and Roundtable participants were some who are among the greatest spinners in that spiral.

Few doubt that science and technology drive progress. The problem is that hardly anybody, particularly out in lay-land, understands that there *is* a spiral of technology and science. Fewer still know what to do about it.

Not too long ago we were all witness to the spectacle of 13 presidential candidates dashing around the country, talking about farm policy, trade deficits, jobs, economic competitiveness, national defense, and so on. Now these are *weighty* issues and each *may* influence some fraction of our population. . . but not one of the candidates talked about *science* which is *sure* to influence the lives of *all* of us and the lives of our kid brothers and sisters and of our children.

Why did this happen? Are the Iowa farmers or the Michigan auto workers or the Chicago Commercial Club members too ignorant or too stupid to understand issues related to the ozone layer or acid rain or robotics or microelectronics? Or could it be that the 13 candidates themselves and their political advisors and speech writers are uncomfortable with science and technology? And if they are, as I believe, uncomfortable, why is this? After all, each of them spent at least four years in college - more often than not, a fine college. In college they learned about history - economics - literature and, of course, much else that is a part of life and culture. In history they learned about Napoleon and the Kings of England - but did they learn about Michael Faraday? Here is a quiz: Who changed our lives more? Let me give you a hint. Faraday did more to change

our lives than Napoleon and all the kings of England put together. His scientific insight gave us electricity - motors whose quiet hum powers our civilization, generators that convert falling water or fossil fuels to electrical power to warm us in winter, to turn night into day, relieve us of the drudgery of physical labor, extend our life span, run our factories and hi-fi sets and even our toothbrushes.

In economics we learn about market forces, productivity, the service economy, and all that good stuff, but the ingredients which generate technology and the relationship of pure research to technology are rarely taught. Could it be that the social-science scholars that embellish our academies are uncomfortable with science?

In literature we read and interpret Shakespeare, Saul Bellow, Baudelaire, Tolstoy, and Thomas Wolfe, but we rarely study Newton's *Principia*, one of the most significant books in the history of civilization and, with help, at least as readable as Baudelaire. Could it be that our humanist professors are also uncomfortable with science?

Now, why is this important? It is very important because in the real world out there, the very fabric of human existence will undergo unimaginable and mind-boggling changes over the next 50 years - changes that will be significant over the next decade and even be detectable in the next two or three years. The primary motive force for these changes is science and technology based upon science. What are the contributions to these changes? There is the good news part and the bad news part.

The ecological problems that we've already mentioned represent the serious global effects of industrialization: ozone, greenhouse effect, acid rain, disappearing forests, oil spills. There are shortages: fossil fuels, minerals, nickel and chromium, high-grade iron ore. There are new diseases such as AIDS and Legionnaire's. There is an exploding population - 5 billion people, headed for 8 billion in the not-so-distant future.

These are heavyweight, depressing issues, so let's look at the plus side, which includes the continuing enhancement of the quality of life in transportation, communication, health care, longevity, entertainment, and at least the potential for the spread of the benefits of technology to the non-industrialized 70% of our fellow residents of Planet Earth. At a deeper level, the implications of an in-

creasingly incisive understanding of how our Universe was created is bound to have a profound effect upon our cultural, philosophical, and theological scholarship.

Science illiteracy threatens our entire democratic system. Important national decisions requiring some scientific knowledge are being made increasingly on the basis of ignorance, misunderstanding, and, so we read, even perhaps astrology!!

As business people, engineers, and scientists concerned with the technical world, we have to encourage the uninitiated to make an effort to include science in the essential continuing education that is part of their lives. They should seek out the lay-audience science books (e.g., Hawkings' *A Brief History of Time*), magazines, and TV programs that are increasingly trying to reach out to the intelligent lay audience. These resources give some an appreciation of the nature of science, its powers and its limitations. Serious journals (e.g., *Issues in Science and Technology*, *Bulletin of the Atomic Scientists*, etc.), will discuss the relationship of this intellectual activity to the driving force of our industrial society and indeed the driving force for hope in the third world. There is an additional reward. The intelligent citizen's efforts to learn science informally are often rewarded with surprising joy at the discovery of aesthetic splendor contained in scientific insight.

So, for the sake of yourself, your fellow humans, the planet, your children and theirs, my plea to you is to campaign mightily in every way, so that all citizens can share the profit and possible pleasure of science. By all means, don't short change the survival factors in a continuing lifelong effort to make your fellow citizens comfortable with this thing called Science.

We hope you find these notes from our Roundtable interesting. If you are a businessman interested in the science and technology at Fermilab, join the Fermilab Industrial Affiliates. All you need to do is pick up the phone and call me at (312) 840-3211 or Dick Carrigan at (312) 840-3333.

