

## professional responsibility: politics, culture, and religion versus science and technology

Colleagues, greetings from the U.S. Capital! The topic I chose for this column relates to ethics, morality, and our professional or intellectual duties. I believe that many of us choose not to address, at least publicly, issues related to what I would like to name *public information censorship*. Whatever we individually choose to do can and will have very serious consequences for this and future generations. In a world where population growth and life expectancy are steadily increasing and straining resources, we need to create a conscientious and rational society, where key national policies are not formulated on the basis of misinformation and falsehoods in which reason and evidence do not see the light of day. Such actions have only exacerbated the persistent and the resilient nature of societal problems. This may be easier said than done, particularly, because rejection of religious dogma (as an example) could be considered heresy and may lead to the expulsion of individuals from the religious group.

### Introduction

The IEEE Engineering in Medicine and Biology Society (EMBS) is part of a larger organization. Both the EMBS and the IEEE, at this higher umbrella level, have members that represent practically every nation in the world. These nations have as well as represent a variety and range of cultures, education, religions, economies, politics, and even legal systems. Having said this, I wonder who defines our respective personal ethics and morality when it comes to informing the public. What is our collective code of ethics and morality, when it comes to informing the public and seeing to it that they receive factual, timely, and necessary information responsibly? Who should determine such a code?

Should this be our respective community leadership, governments, professional societies, or groups? Should we (EMBS or IEEE) have a voice of our own?

I believe that our profession is capable of providing a much needed, professional, and balanced perspective. Through the ages, society's perceptions of contributions by science and scientists have also changed. In spite of significant advances, much remains to be done. In the past, many scientists paid with their lives for claiming ideas that went against the central authority of the Church. Today, professional organizations still

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fear addressing topics that are not popular among all of its membership. Governments, on the other hand, may censure scientific thought if the scientific conclusions are not aligned with their mainstream political agendas. In either case, the general public may not receive the benefit of a total scientific or technological education that they deserve from us.

The question is then what are we supposed to do? How are we supposed to advance our careers for the benefit of mankind? How do we educate the

human race? Perhaps, despite these differences (political, religious, cultural, etc.), we could strive, using our professional organization, to provide the global public a more sensible and accurate perspective of the impact of science and technology in their lives.

### Back in History

Regardless of the country where you live in, the political system, religion, culture, and even the economic system of your country will affect the way you are educated and the way you think. For example, political and/or spiritual leaders may prohibit publications or public dissemination of scientific information.

In the field of astronomy, undoubtedly one of its founding fathers and easily one of the most recognized names in the history of the field was Copernicus [1], who lived in the 16th century and was the first astronomer in recent times to write a major work suggesting that the earth revolves around the sun. This idea of a solar system [2] was his greatest contribution, and it provides the basis for our present day concept of the universe. "Opposition was first raised against the Copernican system by protestant theologians for biblical reasons and, strange to say, it has continued, at least sporadically, to our own days. On the Catholic side, opposition commenced only 73 years later, when it was occasioned by Galileo. On 5 March 1616, the work of Copernicus was forbidden by the Congregation of the Index 'until corrected,' and, in 1620, these corrections were indicated. Nine sentences, by which the heliocentric system was represented as certain, had to be either omitted or changed. This done, the reading of the book was allowed. In 1758, the book of Copernicus disappeared from the revised Index of Benedict XIV. Copernicus's genius appears in the fact that he grasped the truth centuries before it could be

proved. What is most significant in his character is that while he did not shrink from demolishing a scientific system consecrated by a thousand years' universal acceptance, he set his face against the reformers of religion" [3]. Galileo's championing of Copernicanism was controversial within his lifetime [4]. The geocentric view had been dominant since the time of Aristotle, and the controversy engendered by Galileo's opposition to this view resulted in the Catholic Church's prohibiting the advocacy of heliocentrism as potentially factual, because that theory had no decisive proof and was contrary to the literal meaning of the Scriptures. Galileo was eventually forced to recant his heliocentrism, and he spent the last years of his life under house arrest on orders of the Inquisition.

**Pontifical Pardon**

"Even though Polish astronomer Nicolaus Copernicus died the very day he received his copy of his work *De Revolutionibus Orbium Coelestium (On the Revolutions of the Celestial Spheres)* in 1543, he had included in the preface of the book a plea to Pope Paul III to consider his revolutionary theory that the earth revolved around the sun rather than the other way around. 'I can readily imagine, Holy Father, that as soon as some people hear that in this volume I ascribe certain motions to the terrestrial globe ... they will shout that I must be immediately repudiated together with this belief. ... Those who know that the consensus of many centuries has sanctioned the conception that the earth remains at rest in the middle of the heaven as its center would, I reflected, regard it as an insane pronouncement if I made the opposite assertion that the earth moves.' Copernicus argued that his logic and the soundness of his principles would 'dispel the fog of absurdity by most luminous proofs,' but his feared repudiation became a reality in 1616 when the Vatican placed *De Revolutionibus* on its list of forbidden books. The book was removed from the list in 1822, but it was only recently, in June 1999, that Pope John Paul II pardoned

and defended Copernicus in an address to Polish academics and scientists" [5].

**Defining a Current Problem**

On 23 October 2007, Dr. Julie Geberding, the director of the Centers for Disease Control and Prevention (CDC), was asked by a U.S. Senate Committee on Environment and Public Works to provide a testimony with regard to climate change and public health. Her prepared statement, which can be found in [8] and [9] was originally 14 pages long. This statement was sent to the White House and was reviewed by the Office of Science and Technology Policy (OSTP).

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When the document reached the aforementioned Senate Committee after OSTP review, it was six pages long. In so many words, the head of a U.S. government agency, and a scientist, wrote a statement as it was requested, and a political arm chose to censor it. Consequently, the general public do not get to hear the whole story. Is this right? Should we (U.S. citizens, EMBS Members, and IEEE Members-at-Large) remain silent? Some questions we might ask could take our thinking in many directions.

- Why would the government eliminate every one of the nine risks suggested on the testimony?

- If the intent was to prevent public panic, did this action do that or instead generate more fear and distrust as well (now and for the future)?
- When asked by reporters, this agency administrator claimed that she was not censored (and yet her full statement was leaked to the press). Can we assume that her job was at stake if she admitted censorship?
- Was the CDC created to deal with the public's health and safety or to be a pawn of an administration? In other words, what is the CDC's mission, the public good or to be an administration's lapdog?
- Can the OSTP be trusted to provide good sound scientifically and technical advice to the administration and the public?

It is important to realize that in December 2007 and for a period including the 16 prior months, the House Oversight and Government Reform Committee [6] had been investigating allegations of political interference with government climate change science under the Bush Administration. During the course of this investigation, the Committee obtained over 27,000 pages of documents from the White House Council on Environmental Quality (CEQ) and the Commerce Department, held two investigative hearings, and deposed or interviewed key officials. Much of the information made available to the Committee has never been disclosed publicly. However, their findings include not just the CDC, but the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the Environmental Protection Agency (EPA), and others.

The Committee concluded that "the Bush Administration has engaged in a systematic effort to manipulate climate change science and mislead policymakers and the public about the dangers of global warming" and that it "has acted as if the oil industry's communications plan were its mission statement." It went further by stating that "White House officials and political appointees in the agencies censored

congressional testimony on the causes and impacts of global warming, controlled media access to government climate scientists, and edited federal scientific reports to inject unwarranted uncertainty into discussions of climate change and to minimize the threat to the environment and the economy.”

In summary, I wish to call everyone’s attention to us, our community, those practitioners in engineering, and all the other IEEE Members, and these are some specific questions that we should raise:

- Are we supposed to advance our careers for the benefit of mankind?
- How do we educate the human race?
- Is it not our moral and ethical obligation to say or do something?
- What can we do?
- What should we do?

#### IEEE 2007 Strategy Initiative

The IEEE recently began an engagement in a strategy initiative that applies strategic thinking, explores new ideas about strategic governance, and uses new methodologies for strategic dialogue [7]. On the IEEE Web site, President and CEO (2007) Leah Jamieson explains that “the IEEE has embarked on an enterprise-wide strategic planning process and that this new effort was initiated by the IEEE Board of Directors, which is working to integrate strategic, data-driven thinking and dialogue into the processes by which we make decisions about IEEE’s future. IEEE has committed to engaging in continuous strategic dialog to 1) examine what we do, 2) agree on where we want to go, and 3) determine what kind of organization we want to be.

IEEE’s core purpose was defined as, “to foster technological innovation and excellence for the benefit of humanity,” and the following core values (which are the essential and enduring principles that guide IEEE) were selected:

- 1) *Service to humanity*: leveraging technology and engineering to benefit human welfare; promoting public awareness and understanding of the engineering profession

- 2) *Global focus*: supporting and embracing the global nature of and the need for technical work and engineering solutions
- 3) *Trust and respect*: promoting a culture where contributions at all levels are valued; encouraging member-driven, volunteer-led, knowledge-based projects; building effective volunteer/staff partnerships
- 4) *Growth and nurturing of the profession*: encouraging education as a fundamental activity of engineers, scientists, and technologists at all levels and at all times; ensuring a pipeline of students to preserve the profession
- 5) *Collaboration and community building*: cultivating active, vibrant, and honest exchange among cross-disciplinary and interdisciplinary global communities of technical professionals
- 6) *Professionalism*: creating a world in which engineers and scientists are respected for their exemplary ethical behavior and volunteerism.
- 7) *Intellectual activity*: engaging in forward thinking; nurturing new and existing science and technology
- 8) *Peer reviewed*: using unbiased information to enhance the quality of life for all people.

I studied the OSTP purpose and their activities and then analyzed the details of the IEEE 2007 Strategy Initiative and compared them. I found that there is a clash between them in at least seven of our eight core values: 1, 2, 3, 5, 6, 7, and 8 to be more specific.

Also, the vision statement used in this strategic planning effort that describes a clear and compelling catalyst that serves as a unifying focal point of effort (IEEE’s Big Audacious Goal) was defined as being: “...essential to the global technical community and to technical professionals everywhere, and be universally recognized for the contributions of technology and of technical professionals in improving global conditions.”

Aside from the moral and ethical issues that I am raising here, there is the additional issue of developing and deploying key national policies. If politicians, i.e., congressional leaders, are not well informed on a given science and technology

issue, the chances are that related funding (if any is appropriated at all) would be based on inaccurate or incomplete information. This, in turn, would affect every decision that is being made, and indeed it has! Let us not forget that most politicians are lawyers who largely lack a much needed science, math, and or technical background. How critical is then an accurate and complete testimony given to Congress? In addition and in the context of professional responsibility, the engineering community not only has a personal responsibility to provide appropriate advice to congressional parties but must also see to it that proper information is acted on in the national interest to benefit all nationals of our respective countries.

#### Conclusions

Currently, the topic of global warming is has captivated the world’s attention. It is clear that it affects all of us, and, of course, we must all work together to resolve it. It is important, while thinking of this subject, to connect all elements in the chain of events so that a collective effort based on such linkages can then result in improved outcomes. In the last 15 years, all countries have become more dependent on services and goods from the rest of the world. We could and will be having a similar discussion on the topic of sustainability, which is raised, particularly, because of the population explosion and the future needs of water, food, and energy. Resources are finite. Through international and multinational agreements, many countries have assured themselves of supplies throughout the year. What many still do not realize is that one of the effects of globalization is the implicit codependency we have created. In other words, if something happens somewhere, there is likely to be an effect. Supply chain management is and will be an even more critical risk to the generations to come. We need to think and plan ahead on the future and how we will fulfill society’s needs.

Regardless of where we live, being a biomedical engineer creates an opportunity (based on our educational and professional backgrounds) to educate

policy makers as well as our own IEEE colleagues. For example, while discussing stem cell research, I have found that some IEEE Members in the United States associate stem cell research with cloning, and, therefore, do not feel comfortable engaging in any of the much needed discussions on this topic. Some believe that this attitude is justified because of a religious conviction, while others feel that the result is due to a complete misunderstanding of what this technology or science represents.

If we go back to the time of Copernicus, we should now realize the importance of the continuity of thought that occurs not only in this instance (among Copernicus, Galileo, Kepler, and others) but, in general, as scientists from different generations base their work on theories and work of others previous to them. If intellectual thinking is censored, the process of continuity of thought is ruined.

Although Copernicus used his theory to explain the motion of other celestial bodies, he was never able to prove his assertions mathematically. In fact, his proposal of circular orbits for the earth and the other planets was found to be false, and many of his calculations were quite inaccurate. However, his theory aroused significant interest, and the early 17th century brought with it astronomers including Galileo and Kepler and, finally, the long-awaited proof and refinement of Copernicus's theory as well.

Apart from what happened to Copernicus during his lifetime because of his scientific beliefs and the censorship that occurred for 383 years, one could simply ask why it took that amount of time for the Church to pardon him (June 1999), when society knew a lot earlier that his theory was correct.

The tasks at hand may not be easy or popular, yet I believe that we have a moral and ethical imperative to respond to the current and future crisis. Let us focus on educating the policy makers in all areas where science and technology can affect health and public good. Subsequently, my advice is:

- 1) inform yourself
- 2) get involved in educating policy makers

## **AIMBE**

### ***Supporting Briefing to Congress***

AIMBE joined the National Alliance for Eye and Vision Research as well as several other prominent groups in Washington, DC, on 25 February, to host a briefing for members of Congress on the benefits of new technology to diagnose health problems. Issues presented to attendees included the need for more investment in developing new technologies, Food and Drug Administration (FDA) lag time to bring new products to market, and Centers for Medicare and Medicaid Services (CMS) reimbursement. For a synopsis of the meeting, click on [http://www.eyersearch.org/naevr\\_action/oct\\_briefing.html](http://www.eyersearch.org/naevr_action/oct_briefing.html).

### ***Supporting Funding for the America COMPETES Act***

An amount of US\$4.722 billion is being requested for the Department of Energy (DOE), Office of Science. This is equal to the President's budget request and represents an 18.8% increase over FY 2008 and is consistent with the President's American Competitiveness Initiative and with recommendations made by the National Academies' 2005 report, "Rising Above the Gathering Storm." This will fund many of the new programs authorized by the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act. The funding history of DOE Office of Science is as follows: FY 2006 = US\$3.596 billion, FY 2007 = US\$3.837 billion, FY 2008 = US\$3.973 billion, and FY 2009 Budget Request/Member Request Level = US\$4.722 billion.

The COMPETES funding also touches the Commerce Department's National Institute of Standards and Technology (NIST). The request that the President submitted to Congress includes US\$634 million for core research and facilities programs, a 22% increase (excluding congressionally directed grants) over the FY 2008 appropriations for these programs. This includes funding for the Advanced Technology Program (ATP), now called the Technology Innovation Program (TIP), at US\$.099 billion. The request for National Science Foundation (NSF) under the COMPETES Act is for US\$6.85 billion, a 12% increase over FY 2008. The research and development ventures of the Department of Defense will also increase under this initiative.

AIMBE is working with collations to support these requests. "Dear Colleague" letters are being circulated in both houses. The AIMBE Advocacy Committee is writing thank you letters to reinforce support to all members who sign the "Dear Colleague" letters.

### ***Joining the Alliance for a Stronger FDA***

AIMBE recently became a member of the Alliance for a Stronger FDA. The Alliance for a Stronger FDA unites a broad group of patient groups, consumer advocates, biomedical research advocates, health professionals, and industry to work to increase FDA's appropriations. It is supported by leading public health advocates, including three former Department of Health and Human Services (HHS) secretaries and seven FDA commissioners. The Alliance is designed to be a multiyear effort 1) to assure that the FDA has sufficient resources to protect patients and consumers and 2) to maintain public confidence and trust in the FDA. The credibility of the Alliance depends on the breadth of its membership. For more information about the alliance, visit [www.strengthenfda.org](http://www.strengthenfda.org).

AIMBE is now a member of 20 influential organizations and coalitions, and participation with these organizations helps AIMBE be an active voice in setting public policy and securing federal funding for medical and biological engineering. AIMBE also works with partners on specific projects. For a list of organizations the AIMBE belongs to, visit <http://www.aimbe.org/content/index.php?pid=233>.

### GINA Added to Mental Health Parity Legislation

On 5 March, the House passed the Mental Health Parity Legislation, which would require health insurers to offer mental health benefits equal in cost to medical and surgical benefits. However, there is a twist here: Louise M. Slaughter (D-NY) attached a rider to the bill, which includes language from the Genetics Information Nondiscrimination Act (GINA, HR 493). This would prohibit companies and insurers from discriminating or making business decisions using data from genetic tests. The language, which was part of the original GINA Bill, was added so that it would be discussed during Senate and House negotiations about the bill to avoid a rule to go to a formal conference committee, as it would on its own. The Administration has taken the issue with the genetics provisions. The next step for the House and Senate is to negotiate the GINA Legislation as part of the Mental Health Parity Bill as passed by the House.

### Draft of NIH 2007–2008 Peer Review Self-Study Released

On 28 February 2008, the final draft of the National Institutes of Health (NIH) 2007–2008 Peer Review Self-Study was submitted to Dr. Elias Zerhouni, director of NIH, marking the end of the diagnostic phase of the peer review enhancement effort. The American Institute for Medical and Biological Engineering (AIMBE) fellows and the AIMBE Advocacy Committee and staff actively participated in many of the information gathering efforts hosted by NIH. The pdf file of the final draft report can be obtained from <http://enhancing-peer-review.nih.gov/>

### NIH Announces FY 2008 Fiscal Plan

In an effort to set priorities for managing its biomedical research investments, the NIH recently announced its FY 2008 fiscal plan. The plan is available at [grants.nih.gov/grants/guide/notice-files/NOT-OD-08-036.html](http://grants.nih.gov/grants/guide/notice-files/NOT-OD-08-036.html). The policy also directs each NIH Institute and Center to establish a fiscal policy based on its specific scientific and programmatic imperatives, consistent with NIH-wide policies. The National Institute of Biomedical Imaging and Bioengineering (NIBIB) FY 2008 financial management plan is available at [www.nibib.nih.gov/Funding/Strategies/FY08](http://www.nibib.nih.gov/Funding/Strategies/FY08).

### IEEE-USA Releases Annual Report

In 2007, IEEE-USA President John W. Meredith and the IEEE-USA Board of Directors reaffirmed three broad priorities: promoting innovation through legislation and other means to ensure the competitiveness of U.S. industry in IEEE-USA's fields of interest, providing practicing engineers with tools and resources that support their career endeavors, and encouraging continuing education for sustainable careers, as well as focusing on precollege math and science education. For a review on IEEE-USA's 2007 activities in building careers and shaping public policy, see [http://www.ieeeusa.org/about/Annual\\_Report/2007.pdf](http://www.ieeeusa.org/about/Annual_Report/2007.pdf).

3) similar to the Medical Technology Policy Committee (MTPC), under the IEEE-USA, perhaps, start a similar type of committee in your own country.

For further reading, the redacted testimony of CDC Director Julie L. Gerberding can be found in [8], her testimony to the Committee on Environment and Public Works of the U.S. Senate can be found in [9], and the IEEE-USA MTPC can be found in [10].

### Distinct Quotes on Education

*Education is too important to be left solely to the educators.*

—Francis Keppel

*Education is the instruction of the intellect in the laws of nature.*

—Thomas Henry Huxley

*All who have meditated on the art of governing mankind have been convinced that the fate of empires depends on the education of youth.*

—Aristotle

The views expressed in this column are those of the author and do not reflect the official policy or position of the National Defense University, the Department of Defense, or the U.S. Government.

### References

- [1] *Copernicus*. [Online]. Available: <http://science.wolfram.com/biography/Copernicus.html>
- [2] *The Copernican Model: A Sun-Centered Solar System*. [Online]. Available: <http://csep10.phys.utk.edu/astr161/lect/retrograde/copernican.html>
- [3] [Online]. Available: <http://www.newadvent.org/cathen/04352b.htm>
- [4] *Galileo*. [Online]. Available: <http://www.newadvent.org/cathen/06342b.htm> and [http://en.wikipedia.org/wiki/Galileo\\_Galilei](http://en.wikipedia.org/wiki/Galileo_Galilei)
- [5] O. Gingerich, Commentary.
- [6] U.S. House of Representatives, Committee on Oversight and Government Reform. (Dec. 2007). *Political Interference with Climate Change Science Under the Bush Administration*.
- [7] K. Kowalenko. (Dec. 2007) New initiative looks far into the future. *Institute* [Online]. Available: <http://www.ieee.org/go/strategy>
- [8] [Online]. Available: <http://www.scienceprogress.org/2007/10/redacted-testimony-of-cdc-director-julie-gerberding/>
- [9] [Online]. Available: [http://www.scienceprogress.org/wpcontent/uploads/2007/10/Draft\\_CDC\\_testimony\\_23oct07.pdf](http://www.scienceprogress.org/wpcontent/uploads/2007/10/Draft_CDC_testimony_23oct07.pdf)
- [10] [Online]. Available: <http://www.ieeeusa.org/volunteers/committees/mtpc/>