

George Bugliarello: In Memoriam

Subrata Saha

Address correspondence to: Subrata Saha, Ph.D., Department of Orthopaedic Surgery & Rehabilitation Medicine, SUNY Downstate Medical Center, 450 Clarkson Avenue - Box 30, Brooklyn, New York 11203; Office: 718-613-8652, Fax: 718-221-5317; E-mail: subrata.saha@downstate.edu.

Dr. George Bugliarello, a visionary leader, a gifted engineer, a long-term university president, an excellent educator and researcher, passed away on 18 February 2011 in New York, after a brief illness. He was one of the very early biomedical engineers working in the area of biofluid mechanics. Moreover, his research and contributions encompassed many disciplines, including biomedical engineering, civil engineering, science policy, urban development, water resources, and environmental engineering. He also had a deep interest in the role of ethics in biomedical and environmental engineering and in global health care delivery.

George Bugliarello was born in Trieste, Italy, on 20 May 1927. He obtained his Dott. Ing. degree in Civil Engineering at the University of Padua in 1951, and his MS degree at the University of Minnesota, where he studied as a Fulbright Scholar, in 1954. He obtained his Sc.D. degree in Civil Engineering from Massachusetts Institute of Technology in 1959. Following assistantships at the University of Padua, the University of Minnesota, and MIT, he taught 6 years at Carnegie-Mellon University, where he became Chairman of the Biotechnology Program. As one of the early bio-engineers, I came to know him while he was a faculty member at Carnegie-Mellon University.

Subsequently, Dr. Bugliarello served as the Dean of Engineering at the University of Illinois at Chicago Circle until 1973, when he became President of Polytechnic University (later to become Polytechnic Institute of New York University). He served as Polytechnic's president for 21 years, becoming Chancellor in 1994, University Professor in 1996, and President Emeritus in 2003.

During his long academic and scientific career, Dr. Bugliarello received many awards, including the Walter L. Huber Civil Engineering Research Prize of the American Society of Civil Engineering in 1967 and the 2009 Marconi Society's Beacon of Light Award. Dr. Bugliarello was awarded honorary degrees from Carnegie-Mellon University, the University of Trieste, the Milwaukee School of Engineering, Illinois Institute of Technology (IIT), Pace University, Trinity College, Rensselaer Polytechnic Institute (RPI), and the University of Minnesota. He was a Fellow of the American Association for the Advancement of Science (AAAS), the American Society of Civil Engineers (ASCE), the American Society of Engineering Education (ASEE), the New York Academy of Sciences (NYAS) and the Biomedical Engineering Society (BME). He was inducted as a Founding Fellow of the American Institute for Medical and Biological Engineering (AIMBE) in 1993. He served

as the president of the Sigma Xi, the Scientific Research Society, from 1992 to 1993, and at the time of his death he was serving as Chair of Sigma Xi's Committee on Ethics. Starting in 2007, to honor Dr. Bugliarello's contributions, Sigma Xi society started the George Bugliarello Prize that is awarded to a superior interdisciplinary essay, review of research, or analytical article published in *American Scientist*, Sigma Xi's bimonthly magazine of science and engineering.

Dr. Bugliarello chaired the Board of Science and Technology for International Development of the National Academy of Sciences (NAS) from 1979 to 1983. From 1978 to 1983, he chaired the Advisory Panel for Technology Transfer to the Middle East of the Office of Technology Assessment, and from 1986 to 1989, he chaired the Committee on Science, Engineering, and Public Policy of the American Association for the Advancement of Science (AAAS).

Between 1982 and 1995, Dr. Bugliarello served, for the Organization for Economic Cooperation and Development, as a reviewer of the science policies of Portugal, Greece, Italy, and Turkey. His vast international experience also included consultantships for UNESCO and assignments as a specialist for the U.S. Department of State in Venezuela and Central Africa. From 1984 to 2000, he served as the U.S. Member of NATO's Science for Peace Steering Committee (previously the Science for Stability Steering Committee).

Dr. Bugliarello was elected a member of the National Academy of Engineering (NAE) in 1987, served on that organization's Council from 1989 to 1993, and chaired several National Academies activities, including the Board on Infrastructure and the Constructed Environment, the National Academies Megacities Project for the Habitat II Conference, and the National Research Council's Committee on Alternative Technologies to Replace Anti-Personnel Landmines from 2002 to 2009. He served as a member of the U.S. National Academies–Russian Academy of Sciences Committee on Terrorism Confronting the U.S. and Russia, including co-chairing a joint Russian–American Task Force on Urban Security.

Dr. Bugliarello was elected Foreign Secretary of the NAE in 2003 and would have completed his second term in that position in June 2011. In his capacity as Foreign Secretary, he chaired the NAE Council's International Affairs Committee and participated on (intermittently as chair) the Committee on International Programs of the National Research Council's Governing Board.

In New York, as president of Polytechnic University, George Bugliarello spearheaded the creation of MetroTech, the large university–industry park that now surrounds the Polytechnic Institute of NYU, and received in 1994, in recognition of the creation of MetroTech, the New York City Mayor's Award for Excellence in Science and Technology. He was also recognized by the Marconi Society, from which he received the 2009 Beacon of Light Award.

Dr. Bugliarello lectured extensively, and from 1996 to 1998 he was a Distinguished National Lecturer of the Sigma Xi. He was co-founder and co-editor of *Technology in Society—An International Journal* and was interim editor-in-chief of *The Bridge* (the

quarterly publication of the NAE). He authored more than 300 professional papers and was author or co-author of numerous books.

He was a member of the Council on Foreign Relations, served on the Board of Directors of the Lord Corporation and the Jura Corporation, was a Trustee of The Paul and Daisy Soros Fellowships for New Americans, and was a member of the Board of Directors of the Marconi Society.

Dr. Bugliarello remained active at Polytechnic Institute of NYU teaching two Civil Engineering courses: “Sustainable Cities” and “The Biosoma—Environmental Design of the City of the Future.” While dean at the University of Illinois, Dr. Bugliarello began to think about how natural, mechanical, information, and energy systems affect society. This intertwining of biological organisms, social institutions, and machines, which he called “biosoma,” became a lifelong investigation and formed the basis of his courses. In 2003, he published *The Biosoma: Reflections on the Synthesis of Biology, Society, and Machines*.

Dr. Bugliarello is survived by his wife, Virginia, and two sons, Nicholas and David. He leaves behind a rich legacy derived from his depth of knowledge, remarkable vision and leadership, genuine concern for the human condition, magnificent ability to inspire, and gracious personality.

In a recent retrospective article on George Bugliarello, Ilan Juran, and John Falcocchi, two of Dr. Bugliarello’s colleagues at Polytechnic Institute of New York University wrote, “He was an elite humanistic explorer, whose creative scientific work and educational dedication was often inspired by a holistic quest for understanding the universe of the complex and intertwined relationships among biological, societal, environmental, and technological systems. For him, engineering was the art of creating technology and systems as the processes that human societies devise to modify or preserve nature for their sustainable development, and the capability of their strategic integration in the design of the metropolis to address future societal needs.”¹

His interest and commitment to the study of ethical issues is exemplified by the fact that he was a Keynote speaker at the 1st International Conference on Ethical Issues in Biomedical Engineering that I organized at Clemson University in 1997. The title of his talk was “Bioengineering Ethics: The Ethics of the Linkage between Engineering and Biology.”² Dr. Bugliarello was again a keynote speaker at the 3rd International Conference on Ethical Issues in Biomedical Engineering held in Rochester, New York, in June 2005. His talk addressed the issue of “Bioengineering Ethics: Complexity and Synthesis.”³ He was also a keynote speaker at the 4th and 5th International Conferences on Ethical Issues in Biomedical Engineering that were held in Brooklyn, New York, in April 2007 and 2009, respectively (Figs. 1 and 2). The title of his talk at the 4th International Conference on Ethical Issues in Biomedical Engineering was “Biomedical Engineering Ethics and Cultural Specificity.”⁴ He addressed the issue of “Reflections on Morality, Ethics and Bioethics Decisions” in his keynote address at the 5th International Conference on Ethical Issues in Biomedical Engineering.⁵ Subsequently, this paper was published as the lead paper in the first issue of *Ethics in Biology, Engineering, and Medicine, An International Journal*.⁶ He was also scheduled to be the first keynote speaker



FIGURE 1: (a, b) Dr. George Bugliarello presenting his keynote address at the 4th International Conference on Ethical Issues in Biomedical Engineering, Brooklyn, New York, 20–27 April 2007.

at the 6th International Conference on Ethical Issues in Biomedical Engineering held in Brooklyn, New York, 1–3 April 2011. The title of his talk was going to be “Global Health Care Delivery: A Pandora’s Box of Ethical Issues.”⁷ Although the abstract of this talk was published in the *International Journal of Medical Implants and Devices* (Vol. 5, No. 1), that contained all the abstracts to be presented at the 6th International Conference on Ethical Issues in Biomedical Engineering, his speech was never delivered due to his untimely death just a few weeks before this conference.⁷ However, his nearly finished manuscript on this topic was completed by his wife, Virginia Bugliarello, and it is published in this issue of the *Ethics in Biology, Engineering and Medicine, An International Journal*.



FIGURE 2: Dr. George Bugliarello presenting his keynote address at the 5th International Conference on Ethical Issues in Biomedical Engineering, Brooklyn, New York, 3–5 April 2009.

REFERENCES

1. Juran I, Falcochio J. George Bugliarello (1927–2011). *Science*. 2011 April;332:50.
2. Bugliarello G. Bioengineering ethics: The ethics of the linkage between engineering and biology. *Crit Revs Biomed Eng*. 1997;25(2):108.
3. Bugliarello G. Bioengineering ethics: Complexity and synthesis. *Int J Med Impl Dev*. 2005;1(2):101.
4. Bugliarello G. Bioengineering engineering ethics and cultural specificity. *Int J Med Impl Dev*. 2007;2(1):13–4.
5. Bugliarello G. Reflections on morality, ethics and bioethics decisions. *J Long-Term Eff Med Impl*. 2008;18(1):3.
6. Bugliarello G. Ethics of medicine, biology and bioengineering at the new critical crossroads for our species – Beyond Aristotle and Hippocrates. *EBEM*. 2010;1(1):3–8.
7. Bugliarello G. Global health care delivery: A pandora’s box of ethical issues. *Int J Med Impl Dev*. 2011;5(1):1.