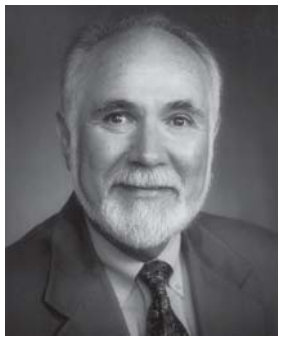
Guest Editorial

Science: The Glorious Entertainment



For most people, *science* is a noun. For those of us engaged in experimental scientific research, 'science' is a verb. Doing science is a calling, a dedication to curiosity, wonder, frustrations and success. To engage in the scientific process is to find explanations for fundamental questions of nature as well as to contribute to the enhancement of the human condition on earth (and beyond).

I'm reminded of a quotation from the enormously talented Professor William S Beck: 'Science is exciting. It is fun! It is a romantic and compelling call to adventure.' What could more dependably fire the imagination than an expedition into the unknown by man (or woman) armed only with curiosity and ingenuity?

For me, upon reflection, doing science (craniofacial developmental and molecular biology) for almost 50 years has been and continues to be a most rewarding passion of mine. The last 50 years of scientific research and discovery has been nothing short of remarkable … from observations and qualitative descriptions to mechanisms and applications for diagnostics, treatments, therapeutics, biomaterials, health outcomes and so much more. When I was a high school student in the early 1950s, it is seemingly impossible that I would participate in gene discovery in the 1980s, and that the entire human genome would be completed by October 2004 and that the results would become available 7 days a week and 24 hours a day on the internet (see www.nlm.nih.gov).

Further reflection reminds me that rapid progress in the behavioral and biomedical research areas over these 50 years has witnessed a transition from solo science practitioners in a specific discipline to interprofessional teams representing multiple disciplines. Today, we herald the provision of skill sets that enable curious men and women around the globe to develop their communication skills, a willingness to cooperate within and between disciplines and nations, a preparation to collaborate among disparate scientists around the world and a zeal to coordinate efforts to achieve optimal results. Recently, I expanded my thinking in this area, especially as related to leadership in the biomedical arena, through my new book 'Birth of a Discipline: Craniofacial Biology' (available as a digital book through iTunes and in hardback from dentalaegis.com).

Our future is even brighter, when we consider the emerging research opportunities to be found within phenomics whereby we expand the role of astute clinical evaluations and coordinate with genomics. In order to realize 'personalized health care' and the remarkable contributions from high throughput genotyping, we must observe, collect and analyze sensitive and specific phenotype information from large samples of our population. In this sense, clinicians are crucial to increase study power while decreasing observational or measurement errors. Phenomics is the systematic measurement and analysis of qualitative and quantitative traits, including physical observations, vital signs, blood, urine and saliva chemistries and biochemical real-time metabolic data that collectively define the phenotype.

One illustration applied to craniofacial malformations is found in skeletal dysplasias, especially those presenting craniosynostosis. Craniosynostosis, the early fusion of skull sutures, is a serious abnormality of infancy and childhood requiring astute diagnosis and treatment. Because there are many forms of craniosynostosis, both in isolated as well as within syndrome, accurate diagnosis is essential before effective treatment can be implemented.

During the 1990s, we experienced a profound set of molecular or genetic discoveries that rapidly led to an epiphany of sorts in the diagnosis of a number of clinically different syndromes that each presented craniosynostosis in common and were each variations in genetic point mutations within the fibroblast growth factor receptor 2 (FGFR2). Coordination between clinical phenotype and exquisite genotyping led to the realization that Apert, Crouzon, Pfeiffer, Jackson-Weiss and Beare-Stevenson cutis gyrata syndromes each presented different point mutations all found within the FGF2 gene.

As we progress into the 21st century, major reforms are indicated as to the essential competencies that must become part of health professional education and clinical practice. We recognize that in the previous hundred years, major reforms in medical, dental, nursing and pharmacy professional school education coupled with significant public health measures essentially doubled the human lifespan. Science, technology, prenatal care, early childhood development, advances in primary and secondary education and enhancements in human behavior together made this possible. In the past 50 years, the discoveries within the discipline of craniofacial biology—as well as from other tangential fields that have been applied—have led to significant changes and paradigm shifts in terms of health care practices. Much of this has been the result of health promotion, risk assessment, preventive practices, improved diagnostics and treatment planning, procedures and therapeutics, biomaterials and predictable outcomes.

Despite these productive years, we see glaring gaps and inequities in health that persist in all too many countries. We experience new and re-emerging microbial infections, the challenges from chronic and destructive diseases and disorders,

profound advances in gene-based diagnostics, major increases in the 'aging' population of industrial nations, together presenting profound challenges to health care and national as well as individual costs. Health professional education has not kept pace with the profound changes in demographics, economics, population migrations and discoveries in the physical, biological, chemical and behavioral sciences.

This author anticipates an increased emphasis on developing critical thinking, the ability to access and analyze data bases relevant to clinical health care, an increase of integration between health professions to address the needs of society (especially the special needs of an aging society in industrial nations), and skills that enable leadership within trans-professional teams of health professionals. These and other features of education and clinical practice will be informed by science and the needs of societies around the world. I envision oral health being integrated into primary health care and family medicine. For example, the dividends from investments in craniofacial biology research will transform diagnostics, treatment planning, treatments and therapeutics, outcomes and reimbursement standards. Imagine that we will provide routine saliva as an informative fluid for diagnostics for oral-systemic diseases and disorders. Imagine that we will utilize gene-based diagnostics and biomimetic approaches for tissue and organ replacement and/or regeneration. The future is bright with opportunity!

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