Eur. J. Prosthodont. Rest. Dent., Vol. 13, No. 1, p 2–3
Printed in Great Britain

Editorial

Building Bridges for the Scientific Advancement of Prosthodontics

There are compelling reasons to be both proud and frustrated regarding our state of affairs in prosthodontics research and to be uncertain regarding our future. These views derive from my service to the IADR Prosthodontic Research Group as program chairman for a number of years, similar service to the Dental Materials Group, duties with research committees of prosthodontic organizations and opportunities to become familiar with research groups worldwide, both university- and industry-based.

There has never been a more open mindset among prosthodontists regarding the need to stop teaching dogma and start defining, examining, and (our job) increasing the depth of the evidence-based supporting clinical practices. The future has never been brighter in terms of the significance level of contributions that researchers are poised to deliver to practicing prosthodontists. Our natural partnership with basic scientists and bodies of knowledge in "non-traditional" disciplines is becoming recognized. Our ranks are increasingly influenced by the energies and attention of scientists and clinician-scientists having advanced training in such areas as bone physiology, molecular biology, tissue engineering, surface metrology, materials science and the behavioral sciences. Topics related to cellular responses and nano-scale materials/concepts are finding invited spots on major prosthodontic programs. The Prosthodontic Research Group of the IADR has responded by expanding its recognition of outstanding student research into two areas from one as part of the Frechette Research Award program (awards now given in both materials science/bioengineering and biological sciences/tissue engineering).

Major organizational programs are reinforcing both the potential and the impact of prosthodontic research. The FDI is reaching out to the IADR with efforts to close the laboratory-practice gap. In the United States, the NIDCR has created two new programs related to clinical trials: one establishing a large practice-based research network and the other training programs in clinical research. Over the last ten years both new and enriched sources of research funding have become available for post-doctoral students. Research tools that would have amazed our predecessors are becoming routinely available at many universities and dental scientists are increasingly welcomed onto teams engaged in multi-discipline programs. We continue to enjoy supportive and professional relationships with the dental materials and device industry.

That said, it is hard not to be frustrated by the lack of talented scientific mentorship available to junior faculty and residents of post-doctoral prosthodontics. At many institutions this is compounded by a serious lack of understanding regarding scientific method or an appreciation of the effort involved in good hypothesis development, experimental design, and data analysis on the part of our community leaders – i.e. science is not really well understood or welcomed as part of the program. The impact factor ranking of a major journal publishing prosthodontics research (44th of 46) may be a related indicator (unlikely an indication of editorial quality but rather a reflection on the material available, or obligated, for publication). While we can all identify our researcher/clinician stars few realize that these individuals persevered against a system in achieving dual capabilities – we have virtually no well integrated programs of study facilitative of combining the practice of prosthodontics with achieving basic science credentials. Such is not the case for orthodontics, periodontics or even pediatric dentistry. Our impressive state today – wonderful resources and a cadre (albeit small) of well-trained talent – is ironic and a bit serendipitous.

While growing a larger base of academic prosthodontists trained as scientists is problematic, encouraging our departments and training programs to becoming more engaged with existing scientific talent is not. However, there are some inherent cultural barriers to engaging our scientific colleagues as research mentors. Universities provide home to rather diverse groups of faculty, creating serious challenges for interdisciplinary or joint activities, especially where students are perceived as being "shared." Most prosthodontic program directors were nurtured in environments heavily focused on the "logic of empiricism" characterized, "…as a system of rules of operation and criteria of empirical evidence and prediction."[1] In addition, prosthodontic training is done in relative isolation and is heavily reliant on the passing of knowledge and practice from one or two key individuals. We share both characteristics with faculty in disciplines such as medicine, architecture, and mechanical engineering. In contrast, basic scientists are nurtured in environments focused on the "logic of inquiry" having problem solving as a central theme[1]. This world is inherently more likely to view discipline boundaries as artificial, to welcome team approaches to problems and to value academic contributions over personalities.

It has been my experience that basic scientists become fascinated with our research problems when given opportunities and assistance in understanding dentistry. Prosthodontic students clearly benefit from access to existing laboratories and expert advice. Our cultures clash first when program directors fail to value or understand the contribution being made by the scientist and second when the scientist fails to understand that research cannot become a priority for resident or junior faculty time. The latter problem is relatively easily addressed by agreeing to the time to be devoted, and to whether the nature of the project allows for continuous intermittent

progress or will require larger blocks of devoted time. Consideration might also be given to encouraging a more enriched mentoring experience for that occasional student having a strong science background or academic potential – by allowing some reduction in time devoted to aspects of dental laboratory technology, repetitive seminar experiences, or tasks of lesser scientific value (e.g. table clinics). The former problem is more culturally divisive and potentially intractable. Program directors and department heads who view scientists simply as technicians (i.e. access to the "Instron") and then also ignore well-developed ethics regarding scientific authorship will not build bridges for the profession. Basic scientists have much to offer regarding the refinement of hypotheses, experimental design, statistical design and analysis, data interpretation and manuscript production, and have often trained more intensively than prosthodontists. Broadly accepted scientific ethics are violated when program directors and senior faculty who have not contributed to the scientific product assume authorship rights because it is "their student" (simply editing a paper or serving on a thesis committee are not regarded as authorship contributions). Both the scientist and their inherent work product (research) are devalued by such practices. Unfortunately, "political authorship" is still widely accepted in prosthodontics. An excellent treatise on research ethics is available from the National Academy Press[2].

Important questions will always arise related to prosthodontic treatment options and outcomes. Research activities both enrich our practice and help to further define and promote prosthodontics as a specialty. Our community is simply too small to "go it alone" in developing a command of the increasingly broad and sophisticated basic sciences that can have a positive impact on our future. Perhaps a cultural change is in order to facilitate long-term scientific partnerships, allowing our students and junior faculty to engage in increasingly meaningful pursuits of evidence.

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