Almost 2 years ago, I wrote my opening editorial as the new Editor in Chief of the *Annals of Occupational Hygiene* citing the many challenges facing our field, and identifying areas in which I thought the Annals could contribute to meeting those challenges ([Seixas, 2013](http://www.healthdata.org/results/data-visualizations)). At that time, I may have been a little heavy on the challenges, and only mildly convincing that there were clear opportunities for occupational hygiene science to advance the cause of preventing occupational disease and disability.

The Scientific Committee on Epidemiology in Occupational Health Conference, EPICOH, a committee of the International Commission on Occupational Health (ICOH), met in Chicago Illinois in June for their 24th International conference, taking up the theme of ‘Challenges for Occupational Epidemiology in the 21st Century’. I thought—‘Here we go again, recounting all the ways in which our prospects for reducing injury and illness at work are stymied by changes in the economics and politics of work in the post-industrial, globalized and climate-threatened world’. Despite the very real challenges to our work, I am happy to report that progress is being made, that there is cause for optimism, and that occupational hygiene, or more generally, occupational exposure assessment, is at the very root of these opportunities.

The keynote presentations made throughout the conference brought forward some of these key themes. Dr Lesley Rushton from Imperial College, London, opened the conference with a discussion of the burden of occupational disease and injuries, especially cancer, and estimated that as a generic risk factor, ‘occupational exposures’ globally rank 11th in causes of disability adjusted life-years, and are responsible for ~3.6% of all cancer deaths (4.8% in males, 2.0% in females), largely due to environmental tobacco smoke (at work), asbestos, diesel exhaust, and silica exposure ([Rushton, 2014](http://www.healthdata.org/results/data-visualizations)). For specific cancers, however, this contribution is even higher and due to decreasing tobacco consumption in many parts of the world would increase in relative significance in the future. The estimates vary substantially by region, and level of development, and can be visualized by a wide range of factors by using the web-based tool available from the Institute for Health Metrics and Evaluation (IHME) ([http://www.healthdata.org/results/data-visualizations](http://www.healthdata.org/results/data-visualizations)). Despite our occasional sense that occupational disease is a problem of the past, or in isolated parts of the developing world, the results suggest that exposures at work are an important contributor to the worldwide burden of ill health now, and will continue to be so well into the future, based on today’s exposure patterns. That risk are not necessarily of the past was further exemplified by the keynote of Eva Schernhammer on shift work which has been linked in several studies to adverse health effects such as cardiovascular disease, metabolic syndrome, and breast cancer ([Schernhammer, 2014](http://www.healthdata.org/results/data-visualizations)).

As noted by Dr Rushton and numerous other researchers at the conference, these estimates of the global burden are highly dependent upon what we know and do not know about patterns of exposure among the population, both in years past and today. Researchers in Australia, Canada, and the UK all reported at the conference on efforts to improve estimates of the population exposed, the exposure time, and level of exposure in order to refine estimates of...
disability and death from myriad exposures at work. These efforts are dependent upon the input of occupational hygienists and exposure assessors in measuring, estimating, or modeling population patterns of exposure. The potential power of the numbers produced by these analyses was underscored by Dr Rushton, making the undisputable point that injury, disease, and disability due to exposures at work are a major modifiable contributor to the world’s public health. They further help to identify the sources of ill health in the future due to exposures occurring today, allowing policymakers to develop strategies for improving the public’s health and setting priorities. And further, that these policies necessarily require the ongoing work of occupational hygiene.

Roel Vermeulen from the University of Utrecht, who is also an Assistant Editor of the Annals of Occupational Hygiene, specifically addressed the importance of exposure assessment and a variety of new or improved approaches (Vermeulen, 2014). Dr Vermeulen made the ‘business case’ for investing in occupational exposure assessment, specifically in the context of occupational epidemiology. On the challenge side, he noted that only 10–30% of disease burden is likely due to genetic factors, leaving the likelihood that the rest have important environmental (including occupational) causes of which many are not yet identified. He demonstrated how the validity of risk estimates derived from epidemiologic meta-analyses, used for standards setting and policy development, are highly dependent on the quantity and quality of the exposure information used. Thus, our ability to effectively control or regulate health relies on the exposure assessments made. On the other hand, Dr Vermeulen identified a range of developing approaches contributing to solving these problems. Algorithms for understanding work history data are improving the feasibility and validity of exposure history questionnaires; a range of ‘omics’ technologies are beginning to show promise for identifying and quantifying exposures; small scale sensors integrated with smartphones or other remote communications technologies are being developed and used to gather exposure information on widely distributed workforces; and existing databases can be exploited for large-scale studies among diverse populations and mixed exposures. In addition, new statistical methods combined with these rich data sources allow for exploration of the complex dynamics of exposure and contextual information to improve risk information. In summary, Dr Vermeulen concluded that not only is detailed and comprehensive exposure information needed to understand and control occupational risks (i.e. that the business case for occupational epidemiology is sound), newly emerging technologies and research methods are providing multiple avenues to meet these challenges. Occupational hygiene science is a central component to these advances.

Dr David Wegman, an epidemiologist and mentor to many of us in the field, was honored for his lifetime contributions, and at the concluding banquet addressed the ‘challenges’ theme by discussing the prominent needs for the field. Among his priorities list was attention to global climate change and the enormous number of workers who will face new and increased risks due to climate-induced occupational conditions. In addition to heat-related illness, he noted that the interaction of temperature extremes with chemical exposures, high workloads, and extended hours of work pose special risks, especially in occupations such as emergency responders, construction/demolition, and agricultural work. While the threats of climate change affect everyone, the resulting intensification of exposures at work requires our special attention. Dr Wegman also called for scientists to act more affirmatively on what we observe. In addition to engaging in public education and policymaking, he identified the importance of intervention effectiveness studies as a way of providing evidence-based options for controlling risks—one of the areas that I identified for further development in the Annals editorial last year. Improving methods for reliable use of self-reported exposure data was also identified as an important area for our research. While exposure biomarkers have easily identifiable strengths, many of their limitations such as inter-individual variability and limited temporality can be addressed by well-constructed and validated self-reported work activities and exposures. Finally, Dr Wegman echoed another keynote address at the conference given by Dr Mark Schenker about immigrants and work risks (Schenker, 2014). He identified the vast changes in global work organization including internal and international migration, and the rise of part-time, contingent and contract work, under- and unemployment, giving rise to increasing levels of
Challenges revisited

• Economic and health disparities and limits on workers’ ability to avoid work-related risks. The challenges to, but also the importance of occupational hygiene in addressing these precarious working conditions is clearly more important than ever.

Finally, the sea of gray hair noticeable at many of our meetings in recent years was not so overwhelming at this one. The conference participants were noticeably younger, junior, and mid-career scientists and the array of cutting edge research on display in the poster sessions was truly impressive. Alexander Keil (University of North Carolina, USA) won the young investigator award with a study on lung cancer among uranium miners with attention to the effect of the ‘healthy worker survivor bias’ (Keil et al., 2014). Three additional young investigators were given special commendation for their studies on the effects of noise exposure on depression (NM Raunkjaer, Aarhus University, Denmark), chlorinated solvent exposures and lung cancer (Francesca Mattei, Inserm, France), and direct exposure to metal working fluid aerosols and obstructive lung disease (Stella Beckman, University of California, Berkeley, USA) (Beckman et al., 2014; Keil et al., 2014; Mattei et al., 2014; Raunkjaer et al., 2014). While all epidemiologic studies, each included a substantial attention to the details of exposure assessment upon which the results are based.

This concrete evidence of new investigators with new ideas and technologies, and a renewed commitment and energy evident at this conference gives us reason to believe that occupational epidemiology, and the exposure sciences supporting it, will continue to thrive. The Annals continues to strive to be at the forefront of these efforts to understand and prevent work-related injury and illness.

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