THE NEXT BIG THING IS SMALL

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Editor

IT'S DIFFICULT TO imagine that engineering the tiniest particles and devices–on the order of a few nanometres or 1/80,000th the diameter of a human hair–could possibly have the most profound effect on our lives since the discovery of electricity.

But that's nanotechnology's potential. National Research Council Canada goes as far as to say that discoveries and applications of nanotechnology may lead to a new Industrial Revolution.

The most visible results so far have been consumer products–antibacterial socks and toothbrushes, ultra-light bicycle frames, water- and dirt-repellent clothing, self-cleaning window coatings, and a profusion of cosmetics.

But, while odour-free socks are nice, the real legacy of nanotechnology will not be in the cool features being added to our everyday stuff, but in its ability to provide solutions for some of our weightiest problems: providing food and clean water to the millions of people worldwide who suffer, reducing our dependence on fossil fuels, detecting and treating disease, and decontaminating our soil and air.

But while this technology will undoubtedly offer countless benefits, that promise is tempered with concerns as well. This is uncharted territory at its most extreme and we may never know all there is to know about the long-term health and safety implications related to nano-particles.

Materials at the nano-scale show different properties–opacity, reactivity, solubility–compared to their macro-scale equivalents, which is what enables all the unique applications we're seeing. For example, the normally white titanium dioxide used in sunscreens becomes more transparent when the particles are nano-sized. Nano-materials may also be more toxic and have the potential to disperse through human bodies and our air, water and soil.

The Consumers Council of Canada says: "Considerable uncertainty exists about the actual risks posed, because information is limited on the potential toxicity of nano-materials and the actual exposure over the life cycle of the product. Regulatory and oversight policies and practices in Canada are in their early stages. Regulators face many challenges that make it difficult to draft appropriate regulations–lack of scientific data, definitions, test procedures and instrumentation to identify and assess the materials; the number and diversity of products being developed; and the difficulty in keeping up with the rapid development of products."

With PEO's decision to add nanotechnology to its list of engineering disciplines, and a recent report on nanotechnology by PEO's Emerging Disciplines Task Force (www.peo.on.ca/publications/Reports/NME_Phase_I_Report_Mar24_2010.pdf), it's the perfect time to delve into how best to regulate this new area in the interest of public safety, and look at both the challenges for engineers practising in this field (acknowledging a multi-disciplinary way of working will be a must) and the role of engineers in establishing a regulatory framework that won't stifle creativity (p. 28). We also explore four of the many diverse applications of nanotechnology happening right here in Ontario under the direction of engineers (p. 48). Σ