Foreword

In 2013 the International Mineral Processing Council (IMPC) published *Minerals Industry Education and Training*, a collection of papers from the special symposium on Minerals Engineering Education held at the XXVI IMPC Congress in New Delhi, India. The centrepiece of this book was a survey of worldwide mineral engineering graduate supply and demand conducted by IMPC's newly established Education Commission. This work was supplemented by 11 papers presented by education specialists from around the world, exploring themes of importance to educators and employers of graduates.

These themes continue to resonate throughout the resources sector. In 2017 the IMPC Education Commission has a broader scope of activities and is developing a program of regular symposia and workshops. This second volume presents papers recently presented at the *Symposium on Education: Mineral Processing for the Future*, held at the XXVIII International Mineral Processing Congress (IMPC 2016) in Quebec City, Canada.

The symposium culminated in a session dedicated to identifying the skills central to mineral processing competency, and the recommendations have been compiled into a ROADMAP for mineral processing education.

Addressing the educational needs of the ever-changing resources industry remains at the centre of current Education Commission work. A survey of leading industry figures indicates strong agreement on critical knowledge areas and skills requirements for mineral processing: *Mineral Engineering Knowledge and Skills for Today's Industry*. Some skills like basic numeracy and engineering skills are expected on commencement of employment, but others can be developed on the job.

A clear definition of the Minerals Processing discipline is the subject of an ongoing study. Dr Lois Finch discusses the approach in her paper *Applying a Logic Model Framework to Mineral Processing Education*.

The Commission is also exploring the current content and quality of mineral processing education programs, and in Section 3 we present findings of a global review of curriculum along with presentations about education programs from several global regions. There are significant differences not only in program duration and content, but also in overall program focus. For example, in some regions of the world (Australia, South Africa) it is common for chemical engineers to be employed as mineral processing engineers, in others (USA, Europe) there is a preference for degrees with a materials engineering focus. This complicates ongoing professional development, as different graduates will have different needs.

A strong theme running through many of the papers in this volume is the considerable strain under which programs are operating, particularly in the United States, Canada and Australia where it is increasingly difficult for small, specialty programs to survive. Professor Courtney Young describes how Montana Tech is meeting this challenge with a small and resourceful faculty team delivering a high quality and engaging learning experience. Strong industry engagement is also an important part of their program, a message echoed by all the presenters.

The issue of gender diversity remains a challenge for our industry, and this is discussed in detail by Dr Kathryn Hadler in her presentation *Where are the Women in Mineral Processing?*

Some excellent examples are provided in Section 5 of truly innovative educational initiatives, including using technology for creating a virtual reality experience at the university of New South Wales and delivery of an interactive on-line mineralogy course from the University of Queensland. An innovative education a model being rolled out in Africa also shows how developed and developing world Universities can work together to deliver high quality programs.

There are some strong and consistent messages coming through about how to deliver good mineral processing education. Firstly, programs must attract, then develop good students. They need high quality faculty who follow leading educational practices to deliver current, relevant programs. University/Industry exchange is essential to ensure relevance. Finally, ongoing professional education is essential to address any gaps in undergraduate education and enable graduates to specialise and adapt to changing technology needs.

The ROADMAP presents a simple, 5-page summary of the essential elements of mineral processing education. It will be useful for anyone reviewing professional competencies, benchmarking programs or developing career plans, such as regulators, professional societies and accrediting bodies.

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