

## Journal Comment

Professor Robbie Robinson written his thought-provoking comments on a monthly basis since 1995, and he assures the Publications Committee that this is not the end of his comments or his involvement with the Journal. However, May 2012 has fallen to me.

This issue contains ten papers covering a range of subjects. Two mining papers concern uncertainty and planning in mining projects. A topic often discussed in the Journal. A further two present fundamental aspects of rock breakage, elastic deformation energy, compressive and tensile. As a metallurgist, when looking at such papers, I wonder whether the understanding that mining engineers have in the area of rock mechanics could not be borrowed to design a new method of rock breaking. One paper talks about abrasion which only recently appeared in modelling of comminution processes.

The employment of Women in Mining made for interesting reading, and I will not comment further in fear of being branded a chauvinist! I noted with interest that the questionnaire technique was also used in the paper about the treatment of Cr(VI)-containing wastes in the ferrochrome industry. Social scientists have often used this technique, and now it is being usefully used in other fields.

The paper from Turkey about chromite recovery by gravity in the MGS and using cyclones was of specific interest to me. I remember that in the 1970s mineral processing seemed all focused on flotation. The odd man out was Richard Mozley, who was developing concentration devices that could treat finer sizes, and he suggested that more could be done with gravity. I worked at the Warren Springs Laboratories (UK) after leaving school and before going to the RSM. Richard had just left the laboratories to join the commercial world and I took over assisting a researcher who was a long-term civil servant. This learned scientist advised me that researchers need to be creative thinkers. The best time for thought was after lunch when 20 minutes of individual creative thinking was essential, which he proceeded to do, or did he just fall asleep! We worked on the pneumatic pinch sluice. Although it performed satisfactorily, it was below the performance of the spiral and Reichert cone, as might be expected when using air as the medium for gravity separation. With a predicted water shortage in many mining areas, surely dry separation devices should be looked at again.

Richard Mozley went on to develop a number of enhanced gravity devices. Some years later I was involved in tin processing for Gold Fields of South Africa, who with Consolidated Gold Fields were

developing tin flotation globally. Flotation superseded gravity for tin in the size range 22 to 5  $\mu\text{m}$ . However, there must be plenty of tin in the of tailings dams of Rooiberg, Union Tin, Wheal Jane, and Renison in the -5  $\mu\text{m}$  fraction. Tools to assist with the understanding of the processes involved in mineral separation have taken great strides forward in recent years, with the likes of Qem\*scan, MLA, ToF-SIMS, MRI, tomography and other non-invasive techniques.

These have lead to many developments in flotation and the understanding of surface chemistry that could be brought to bear on the recovery of -5  $\mu\text{m}$  material. Techniques such as agglomeration and piggy-back flotation might be looked at again. The tools to do so are now available.

The philosophy of these old tin plants was that if it had not been recovered in the current circuit, a novel device could be added to the tailings and the tin recovered there. Thus some fascinating concentrating devices were added to these circuits. With the development of the idea to recover liberated minerals as early as possible in a circuit, multiple stages of comminution were implemented with their respective recovery circuits. Buddles and round frames were removed from the circuit to be lost forever. It is interesting to note that current thinking is along these lines, moving away from single circuits with low capital costs and potentially higher operating costs to multistage circuits of higher capital cost, but lower operating cost, the move being driven primarily by savings in energy and water.

The other metallurgy paper that intrigued me was the upgrading of phosphate using triboelectric separation, again a dry process. A number of researchers have artificially modified the surface properties of minerals before different electrostatic separation processes. This is analogous to chemical reagents in froth flotation to enhance hydrophobicity, where reagents are used to increase the charge differences between wanted and unwanted minerals. Further work on this dampening of mineral surfaces in electrostatic separation does seem to warrant more research.

The minerals Industry talks about the need to solve problems as costs increase, grades decrease, ores get more complex, and metal prices don't keep up. There are some fascinating possibilities out there along with the tools to help understand them and prove them. We need to find the money and people to research them. ♦

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