

Does geoscience face the same warning signal as metallurgy?



A response to "metallurgy's warning signal" — President's Corner, June 2026

In his June 2026 President's Corner, Gary Lane highlighted a disturbing picture emerging in metallurgical engineering: student numbers in one of South Africa's leading departments have declined by almost 70% over two decades, with fewer than ten metallurgical engineering graduates expected this year. The figures raise an important question about whether metallurgy is facing a problem unique to the profession, or whether it is the first visible warning signal of a broader challenge across the minerals capability ecosystem.

To explore whether similar signals are evident in geoscience, I turned to Associate Professor Grant Bybee, Head of School in the School of Geosciences at the University of the Witwatersrand, who has been tracking these trends semi-quantitatively over the past few years. His analysis provides useful context and suggests that the answer is more nuanced than a simple "yes".

Geoscience is exhibiting some of the same structural pressures as metallurgy, but the shape and severity of those pressures differ.

Where the parallel holds

Like metallurgy, global geoscience enrolments are under pressure. Grant's analysis shows declines across several major mining jurisdictions, including Australia, Canada, the USA and UK, while the recent upturn in exploration associated with critical minerals has not yet been accompanied by a comparable recovery in student numbers. The trend is not universal: Chile, for example, saw substantial growth in its graduate geology pool between 2010 and 2023, while South Africa, as is discussed below, presents a different picture.

There are also broader structural challenges. The extractive industries are not always seen as an attractive career choice by young people, and earth sciences often receive very little attention at school — if they are introduced at all. Some students therefore reach the point of choosing a degree without ever having encountered geology as a career or are swayed by negative perceptions about the profession.

The parallels are clear, but the South African data reveal a more complex picture.

Where geoscience differs

The CREST/DSI analysis, drawing on Higher Education Management Information System (HEMIS) data, tracks honours, master's and doctoral enrolments and graduates from 2010 to 2020, giving us a relatively detailed picture of the changing shape of the South African geoscience pipeline.

The first difference is one of scale. South African geoscience honours enrolments peaked at 343 in 2012 before falling to 225 in 2020 — a decline of roughly one-third. That is significant, but different in scale from the near-70% decline in metallurgical engineering numbers over two decades at the department highlighted by Gary.

The national geoscience data end in 2020, so some caution is necessary in interpreting the current position. More recent experience at some individual geoscience departments suggests undergraduate numbers may be steadying, with honours enrolments and graduations increasing and, in some cases, reaching capacity in 2025/26.

The second difference is the shape of the pipeline. Grant's tracking points to what he describes as an 'inverting pyramid'; a potentially thinning enrolment base with a growing postgraduate apex. Against the decline at honours level, doctoral enrolments increased from 133 to 234 between 2010 and 2020, and PhD graduates increased from 14 to 35.

Grant suggests this pattern is not entirely unexpected. Historically, downturns in commodity cycles and mining activity have been followed, typically after a two-to-three-year lag, by fewer bursaries and employment opportunities. More honours graduates consequently remain at university and progress into master's and later doctoral studies. The South African data show this effect in that master's enrolments increased from 318 in 2013 to 538 in 2016, following the sharp fall in exploration expenditure after the 2012 peak.

The transformation at doctoral level is equally significant. The black South African share of PhD graduates increased from zero in 2010 to 43% in 2020, while the black share of PhD enrolments reached 68%.

In other words, while the geoscience pipeline is under pressure at its base, there is evidence of resilience, growth, and

transformation towards its apex. This is where the geoscience and metallurgy stories begin to diverge. The risk in geoscience lies not at doctoral level, which remains healthy and is transforming, but in the potential narrowing of the honours base that feeds both the profession and the future academic workforce.

What this tells us

This comparison raises another important question: how well are we measuring these trends?

We do not currently have this same level of national data across the minerals sector. In South African metallurgy, for example, Grant's review notes that there is no clean national enrolment or graduation series.

We therefore need to understand the health of the entire pipeline, rather than simply count graduates at the end of it.

Globally, geoscience enrolment has historically followed the exploration and commodity cycle, with a lag of two to five years. Non-ferrous exploration expenditure peaked at USD21.5 billion in 2012 before falling sharply, with graduations across the earth-resource professions declining in the years that followed. Exploration expenditure has since partially recovered, but student and graduate numbers have not responded to the same extent.

South Africa, however, does not follow exactly the same clock. Grant's research notes that the local geoscience pipeline has also been shaped by domestic transformation and the contraction of the gold and platinum sectors, rather than simply mirroring global commodity-price cycles.

Perhaps, then, metallurgy is not an exception. It may be the first profession in which the consequences of a broader contraction have become impossible to ignore. Its smaller size, limited cyclical buffering, and position further downstream from the exploration and mining environment may simply make the effects visible sooner.

In that sense, Gary's warning-signal metaphor is particularly apt:

The warning may be system-wide; metallurgy is simply the canary because it is the smallest bird in the mine.

The evidence from geoscience therefore cautions against assuming that every profession within the minerals sector faces the same crisis. Our priority should be to develop the shared measurement capability that allows us to identify where vulnerabilities lie, whether they are cyclical or structural, and where intervention is most urgently needed.

Ultimately, understanding the health of that pipeline means looking beyond whether we have enough geologists, metallurgists, mining engineers, or other specialists today. We need to know whether we are successfully attracting students, educating them, providing meaningful workplace exposure, developing professional capability, retaining experienced practitioners, and transferring knowledge to the next generation.

These early indicators may not look identical across the professions. But if we start looking at them together, we have a much better chance of seeing the bigger picture — and acting before the warning becomes a crisis.

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