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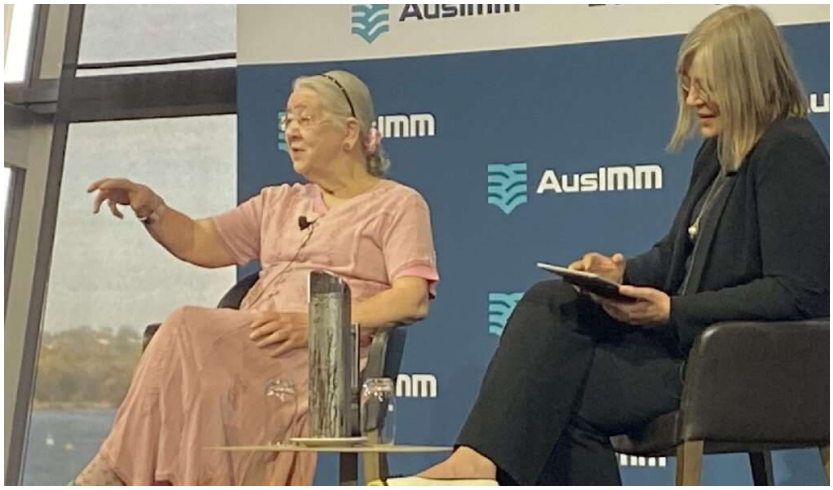
Isobel Clark on lies and geostatistics



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Isobel Clark (left) with Jacqui Coombes at the 2023 AusIMM Mineral Resource Estimation Conference

'We work in the real world and we solve real problems, and we make a difference'

The "giant" on the stage was diminutive in stature, massive in reputation. "All of you in the room have had your careers impacted by Isobel, whether you know it or not," BHP's Cam McCuaig told a roomful of geoscience professionals at the first AusIMM Mineral Resource Estimation Conference in Perth, Western Australia.

Dr Isobel Clark, 75, travelled from Scotland to attend the "first conference in my entire professional life where I have agreed to be on the conference committee".

Why? "Because this conference is about challenging; it's about asking questions. It's about taking part; it is not about sitting there listening to what I did on my holidays for the last two years because I have to give a paper because otherwise my institution won't pay my expenses.

"This conference is about hassling the master."

Clark had little time to herself at this event, which drew an unexpected 500-plus attendees at a time when there is an unprecedented level of discussion and debate around the industry codes used to frame and report mineral resources. In Australia that means JORC and Valmin.

The attendance list included more than 120 international visitors.

Self-described "practical geoscientist" Clark started her professional life as a mining engineer at a time, in 1960s England, when "women couldn't be engineers".

“I saw this advert in the back of The Economist for somebody to teach statistical and computational methods to mining engineers. And I thought, I can do that. Let’s go for it.

“So I phoned them up and asked if I could apply. And once they picked themselves up off the floor, they invited me to lunch … A very British thing, in the mining industry.

“The head of department said to me, I quote, the man that gets this job will be expected to spend one-third of his time teaching, one-third in research and one-third in consultancy to the international mining industry.

“And we would expect him to be a top flight international consultant within 10 years.

“I got the job.

“And I did it in five.

“For the last 40 years, I’ve been running Geostokos Limited, which is a small, totally independent consultancy company, specialising in what we used to call ore reserves.

“What we now have to call mineral resources and reserves.”

McCuaig said Clark remained passionate about “shedding light on what to a lot of people is the black box of spatial relations and geostatistics”. Jacqui Coombes, renowned in mining geostatistics and spatial modelling circles and as a resource governance expert, said she had been wowed by Clark since first crossing her path at the Pietermaritzburg campus of the University of KwaZulu-Natal in the 1980s. One of her heroes had inspired a new generation of professionals in the field with her ability to provide “down-to-earth, practical access to what was once reserved for high-level mathematicians”.

“What Isobel has done for all of us is commit that mathematics to the practical,” Coombes said in conversation with Clark.

Of the origins of that ethos, Clark said: “When I was [first] hired my brief was basically just to apply statistics to mining – because they weren’t quite sure what statistics was about or where it could be useful – but six months in my supervisor, Tommy Thomas, got a call from a mine he’d done some work for previously, saying they couldn’t reconcile their production with their predictions, so could he help them out?

“And in his inimitable style, he said, oh no … I’ve got a woman for that now.

“So he sent me off to Cornwall to spend three weeks on a mine.

“[We were] hand-tracing sections, digitising data and starting out in reconciliation.

“When I got back to London, he [Thomas] said, if you’re going to do grade control I’ve got a couple of papers here that I’ve been trying to read and I don’t understand them at all. This was the guy who refereed [renowned statistician] Herbert Sichel’s first paper on log-normal theory in the South African gold mines … and he [couldn’t] understand the papers.

“I read them and I went back to him and said, I don’t understand them either.

“And he sent me off to Fontainebleau for a three-week course on geostatistics.

“The course was called practical geostatistics and the brochure read, only elementary notions of mathematics will be necessary, such as multiple integration, partial differentiation, convolutions … “

Clark borrowed the title but not the convolution.

“It took them three weeks to teach us what I now teach in three days,” she said.

“So that’s the difference.

“As an engineer in geostatistics, if you like, I see my job as to sift out all the fancy trimmings and the mathematics and the ideas and the rest of it, and actually boil it down to the nuts and bolts of what is really needed and what really works in practice.

“Because I’m a consultant, I’m not an academic.

“Everything has to make sense.

“We are practical people, we’re not mathematicians, and we work in the real world and we solve real problems, and we make a difference.

“My job, most of the time, is to sort of be parachuted into a mine site [or] a head office, take one look at the problem, and go, that’s what is going wrong. Pay me now, I’m leaving.

“So remember: mining engineering first, grade control second, geostatistics third.

“When I started doing practical geostatistics [courses] people came along to find out what the hell it was. And then as time went by, they came to my courses to find out how to do it. And then as time went by, they came to my courses so that they could learn how to write the

software to do it. And then some time went by and they came to my courses to find out what the hell they were doing already.

“Because a lot of the people who come to my courses are already doing the job, but they don’t have the basic training.

“And that, I think, is where we’re failing our juniors.

“We need to give them the grounding that they need, not just how to push a button on a software package.

“I think one of our biggest problems at the moment is … [that we’re] trying to formulate a process so that when your junior geologists come in, you say to them, push this button, paste that into the report, push this button, paste that into the report, push this button, paste that into the report.”

Clark said common sense and a good sense of humour remained universally important in the spatial estimation field.

“Don’t get wrapped up in the theory or be snowed by the experts,” she said, recounting a story of how she walked out of a NATO-sponsored geostatistics forum in the 1980s when a Stanford University student was demeaned by a revered master of the statistics universe at the time for earnestly asking the wrong question. She suggested sharing wisdom was more important than a public belittling.

About one-third of the audience walked out with her.

Consulting geologist Rene Sterk had an impertinent question of his own for the master.

“When was the last time you were wrong?”

And Clark didn’t miss a beat: “Oh, I have been wrong … There was this one time when I thought I was mistaken.”

When the laughter died down, Sterk persisted: “One of the things that I am quite interested in myself is our inability to adjust when we don’t get it right. It’s very difficult to talk about it.”

He said respected consultant Dale Sims’ paper drilling into an “estimation error” (a highly entertaining presentation) was a rarity at an event such as the Mineral Resource Estimation Conference.

“It’s obviously difficult to stand here and poo-poo a company, or poo-poo yourself.

“I find that the most dumbfounding thing in our industry – that we struggle to learn from mistakes because we don’t even know what they are.

“What would you recommend to either the industry or professionals to be more transparent about being wrong so that we can all learn from the mistakes?”

Clark recounted a story about a visit to Blagoveshchensk – "which I think is Russian for arse end of nowhere" – where she started by feeding incorrect information into a model and, not surprisingly, got the wrong outcome. She was told, politely, that she could not be wrong because "you are Isobel Clark".

"I just said, oh boy, have you got a lot to learn.

"We can all be wrong.

"We can be wrong because we don't have all the information.

"We can be wrong because our clients lie to us.

"When I first started out in this field I was taught in my pre-mining youth that you never present an estimate without presenting a confidence level. The word estimate itself implies the word error.

"The first question I would ask anybody is, how good is your estimate when you got it? And they'd all say, why do you need to know that?

"I said, well, I'm sorry, if I'm a project manager and you tell me I'm going to get 15 grams per tonne and I only get 10, you know, that's a hell of a difference. I'm losing five grams; that's a third of my projected income.

"We've made quite a bit of headway on that by bringing in [resource] classification systems.

"I was there when all these reporting codes were first drafted and myself and several prominent colleagues were absolutely positive that we were not going to proscribe estimation methods, [and] that we weren't going to say to people … we must use geostatistics.

"I said, you can't do that. Certainly you can't do that until we invent some sort of professional qualification where we can actually grade people on how well they do geostatistics, or their inverse distance parameters, or anything along those lines.

"This is why we insist on transparency.

"So long as you actually write down everything that you did, how you made your decisions, then that is acceptable within all of the reporting codes and laws.

"I did read a report not too many years ago where the consultant who wrote the report said, in the part where you're supposed to justify your search radii, they said something along the lines of, I've been doing this for 35 years so you can't argue with me.

"I don't think that quite comes under the category of transparency."

Were the industry's best professionals getting better at quantifying and communicating the uncertainty – the risk – in their estimates?

"I'm not sure you're getting it with the investors," Clark said.

“If you’re talking about the customers as being the people who are going to run the mine … It’s [still] an uphill battle.

“My colleagues, the mine planners and so on, will take your block model and assume it’s truth.

“And then three years later, they’ll call me.”