

# SEG 2022 Conference: Minerals For Our Future

---

## Exploration 2.0: Systems to Discovery

Nicole Januszczak, Elizabeth Sharman  
BHP, Toronto, ON, Canada

The majority of nickel sulphide deposits have been found where portions of the intrusion outcrop at or near surface and the bulk of research on nickel sulphide deposits has focused on geochemical processes in the upper crust where ore accumulates and concentrates. Future discoveries under cover will require an improved understanding of the controls on the evolution of nickel mineral systems. Individual ore deposits are part of much larger mineral systems that are the expression of multiple geological processes. This is useful because we can predict and image systems at larger scales where we cannot possibly hope to detect individual ore deposits. Predictive modelling is currently being tempered by our ability to image critical processes and the four-dimensional evolution of nickel mineral systems. This has highlighted critical gaps and driven an accelerated research program that recognizes the importance of geodynamics, the deep origins of the mineral system, our incomplete understanding of the mineral system and our current biases and assumptions. New concepts are being explored, new datasets acquired, and existing datasets improved or used in new ways, to enable reliable prediction of mineral systems and the detection of ore deposits. Systems thinking is the foundation of the exploration process, and not simply a framework used for prospectivity maps. Conceptual predictive models are tested by exploration work programs and a learning loop is established to ensure our understanding of the system, what we are looking for (proxies), and our exploration toolkits are all optimized. The opportunity in this space is truly extraordinary and requires a capacity uplift in exploration teams and their understanding of how nickel mineral systems form so that they are empowered to plan and execute effective work programs, make decisions and progress projects efficiently through the exploration pipeline.