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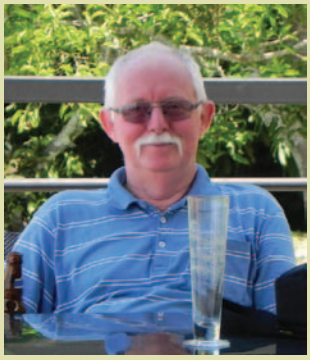
Minerals geophysics



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Mineral exploration and The Three Princes of Serendip

In 1754 Horace Walpole, English art historian, man of letters, antiquarian and Whig politician coined the term serendipity, prompted by 'The Three Princes of Serendip', the title of a fairy tale he remembered in which the heroes 'were always making discoveries, by accidents and sagacity, of things they were not in quest of'. Walpole's memory was a little selective, because in the fairy tale the princes actually made most (but not all) of their discoveries by deductive reasoning. So, it could be argued that Walpole's coining of the word serendipity was in itself somewhat serendipitous.

Serendipity can be compared and contrasted with luck, which may be defined as success or failure brought on by chance rather than through one's own actions. Depending on what your definitions are, there could clearly be overlap between the two. In this discussion I'll consider success through sagacity as serendipity, and success in the absence of one's own actions as luck. Like it or not, serendipity and luck can be significant factors in mineral exploration. The serendipity factor is at least something we might have some control over – luck probably not (unless you believe in the power of rabbits' feet, or the like).

The first stage in mineral exploration - ground selection - is arguably the most critical. No matter how good you are at exploration, if there's no orebody on your ground you won't be able to find one. You can do good work in demonstrating that nothing is down there, i.e. efficiently sterilizing the ground, which will allow exploration to be directed elsewhere rather than wasting further time and money in fruitless effort. But there's no possibility of an exploration discovery - serendipity and luck are irrelevant.

So, to give success (and serendipity and luck) a chance, ground selection has got to be as good as it can be. Selection criteria might include one or more of the following: the presence of mineralisation or significant geophysical or geochemical anomalies, a perception that the geological environment is favourable for the targeted mineralisation, suitability for the application of a particular exploration technique, absence of previous appropriate exploration, or, perhaps, it's the only ground left near to someone else's discovery!

Even the existence of an unrelated anomalous feature might be a factor. Consider the discovery of the Century Zinc deposit in northwest Queensland. As I understand it, CRAE's interest in the area was first piqued by the presence of an extensive annular outcrop pattern of Cambrian sediments overlapping an area of known small-scale vein-type lead-zinc mineralisation. What was this 15 km diameter circular feature; was it perhaps evidence for an astrobleme? Two long lines of ground geochemistry in a cruciform pattern were undertaken. One line passed over one of the only two small surface expressions of the Century deposit zinc mineralisation, which was recognised as such. Luck or serendipity? Certainly the skill of the exploration team in recognising sphalerite and their persistence in having the target drilled were essential to the discovery.

The second stage in mineral exploration is the exploration itself. In the old days, if you didn't walk over the mineralisation outcrop or gossan (and recognise it for what it was) you missed out on a discovery. Prospectors got around this by thoroughly covering the ground, and in some cases using pathfinders, such as tracing surficial gold back to the shedding mother lode. Arguably they made their own luck, at least as far as exposed mineral deposits went. In modern times we strive to achieve the same result with systematic exploration, and where cover exists mineral geophysics plays a critical role. So far so good. We like to think the geophysical tools we employ are adequate for the task if we've done our homework about the nature of the target style and the environment.

Serendipity comes in to play in the recognition of something unexpected in all this systematic exploration. Consider the situation in a lead-zinc exploration program when airborne electromagnetics (with magnetics) is used to search for significant conductors beneath weathered cover. What if the survey turned up a small shallow circular conductor, perhaps with an attendant low-order magnetic anomaly? This is not the target you seek, but in the right environment – say a stable shield setting – it could be indicative of a kimberlite pipe. Surely it's worthy of further consideration? At the very least, if your company is not interested in diamonds, the prospect may be on-sold to help finance future exploration programs.

Ivanhoe Australia's discovery of the Merlin molybdenum rhenium deposit provides a good example of where lateral thinking and attention to detail resulted in an unexpected success. While drilling out the Mount Dore copper deposit, one drillhole passing below the main target intersected disseminated 'mafics'. The exploration team's recognition that this disseminated mafic material was molybdenite (totally unexpected) was the turning point in the discovery process of the Merlin deposit.

So, luck and serendipity do play a part in mineral exploration success. Perhaps we should also be addressing these factors. Adding fortune tellers, astrologers and lucky people to the exploration team may be a step too far, but giving serendipity every opportunity, particularly where it eventuates through sagacity, definitely has merit. Employing and encouraging good observers and thinkers without fixed mind sets might be a good start. It's all about maximising your chance of success.

Horace Walpole by John Giles Eccardt 1747–8.