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# VIEWS

## Industry-Academic Research Projects: The Good, The Bad, and The Ugly

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### Introduction

Industry-academic research projects should be a win-win collaboration; the company gets access to a knowledgeable specialist team that is able to dedicate valuable time and resources to a range of questions, and those in academia may receive funding to help generate new data and advance their research projects. As a bonus, students who are involved receive useful hands-on industry experience. What could go wrong? Why are there not more collaborative projects happening all the time? What can we do to make these projects work?

Over the last 15+ years I have been fortunate to have been involved in over 30 collaborative economic geology and exploration focused research projects with different companies and research institutions on projects all around the world. Most have been good, a few have been bad, and one has been ugly. The following can be applied to any research endeavour and is a personal viewpoint from someone who is still very passionate about trying to use applied research to assist the full spectrum of economic geology from exploration to production.

Richard Lilly is currently the Mount Isa Mines embedded research fellow at the University of Adelaide. The role involves leading a range of exploration and ore deposit-related research projects, undergraduate teaching, and coordinating the National Exploration Undercover School (NExUS). Richard completed his Ph.D. on the geochemistry of the northern Oman ophiolite at Cardiff University (UK) and worked with Rio Tinto and Chevron before joining Mount Isa Mines (formally Xstrata Copper) exploration in 2007 based in Mount Isa, Queensland. In his role as senior exploration geologist, he instigated and co-supervised a wide range of applied research projects with the aim of improving exploration targeting, before returning to an industry-funded academic role in 2015.

### Getting Past Stereotypes

Being an industry-funded research-fellow/liaison is certainly not an easy job; after years working in exploration I didn't grasp how many hours those involved in research actually work. There is no clock-on and clock-off; it's certainly a lifestyle rather than just a job. I also quickly found out that researchers have completely different KPIs (Key Performance Indicators) and that the success of a research project is not measured in meters drilled, tonnes hoisted, or targets found (although it would be nice if that was the end result of some research). In fact, in the first year of my current role, rather than feel like someone trying to span the industry-academia boundary, it was like I was slipping through the gap between both worlds. This made me wonder: is this why there are so few embedded researchers?

Some of the most consistent barriers I have observed that inhibit effective industry-academic research projects are stereotyping and poor communication. Ask just about anyone in the industry about those in academia (even the term "academic"' can be used with a negative connotation within industry), and you will be treated to tales of boffins and their projects that become "too academic to be useful" and researchers who are "only thinking about where their next research grant is coming from." Or (as happened to me twice last year) at the end of a research project meeting the industry geologist stands up and says, "Right, I'd better get on with some *real work* now." This example demonstrates the lack of value that industry often places on advancing geological knowledge and understanding.

However, stereotyping works both ways, and I have heard frustrations from the academic side of the fence referring to their industry partners' "short-term goals" and suggesting that the recipients of their research products "don't care about the results" and "probably won't read it anyway." It is rare to visit an exploration office or mine geology office that doesn't have shelves of often unappreciated (dusty) technical reports and theses—a reminder that researchers have to be diligent in their method of transferring information. The high turnover of industry geologists during boom years is also a hindrance. It is not uncommon for the company geologist who initiated the research project to have moved on by the time the research project has been completed. Likewise, industry priorities change with the market and a three-year study may find itself high and dry if the topic and/or outcomes are no longer relevant to the focus of business by the delivery date (even if delivered on time). Because of this, it is important for all industry-academic research projects to try to retain flexibility where possible.

Other speed bumps that can get in the way of effective collaborative research include the temptation for research to cash in on the good years. ("Let's just add some more stuff to the budget; the company can afford it.") Confidentiality agreements can be stifling (and often unnecessary) and hobble the ability of researchers to publish their results. This alone would be enough to prevent many promising early career researchers from ever getting into collaborative economic geology studies because their career path is inevitably publish-or-perish.

Appropriate field work is also a key element in successful projects; nothing can replace time spent in the field with rocks and meeting those at the operation

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or exploration camp. The worst-case scenario is when an academic supervisor looks at one drill hole and comes up with a model in an afternoon, followed by a student attempting to prove the model for a year and completing a thesis. However, the next hole drilled nearby doesn't fit the model, but the project has now finished. This point also highlights the value of long-standing working relationships; companies are not so keen on fair-weather researchers who arrive when times are good but are not to be seen when the company research funds dry up or the interest of the researcher has been quenched. In some cases this may be unavoidable, since researchers can only take on limited projects, but it does support a step-by-step approach. I like to think of projects as Lego bricks; maybe each study is not breathtaking in itself, but once several are joined together you can start to build something more substantial.

Keeping projects at the appropriate scale is also a key consideration. Low-cost (short-term) Honours and M.Sc. projects are well-suited to specific geological questions that staff may not have time to pursue. These projects often have positive outcomes but may have limited academic impact and rarely result in publication. Midterm and intermediate-cost projects (Ph.D., short postdoctorals) are a good balance, with cost- and time-efficient project milestones based on the time investment by the student and supervisor and a good chance of achieving publication. Large-scale, long-term projects supported by national research agencies obviously cost the most, have many researchers involved, and aim to have far-reaching and innovative outcomes. The bigger (and more expensive) the project, the more pressure there is to produce deliverables with a value to the collaborating organizations. There is no correct path, but keeping a balance of projects on all scales (getting the ratio of useful short-term results and blue-sky research in the right proportion) seems to be the preferred model for many successful collaborative groups.

## The Good, The Bad, And The Ugly

The **good** collaborative project represents the majority, by far; most projects achieve their target and build geological knowledge. Outcomes from short- to mid-term (Honours, M.Sc., Ph.D., and postdoctoral) projects can provide geologic constraints for specific targets, prospects, and systems and can help companies make business decisions based on sound geological understanding. Building momentum with such projects is a key step, since good projects lead directly to more projects, which—building on the established base—can advance knowledge and understanding quickly. This is especially true if they are coordinated by a research champion within the company. This person does not necessarily need to be a senior figure but someone who has a keen drive to advance geological understanding. The university students involved in these projects are normally self-starters and interested in geology. Many gain enough industry experience and insight (plus contacts) through their project to help them get a job or decide to go onto further postgraduate study in a related field. In addition to research outcomes, the collaborative process allows companies to gain exposure to these high-caliber students who may be potential employees.

The **bad** isn't that bad. Some projects do not achieve what was originally intended. Students can go off the rails and research can go off on a tangent. Often this comes down to how much mentoring the student received from supervisors, both academic and industry, and whether key deliverables were well-defined at the start. This kind of project should have a learning outcome for all those involved, both academic and industry. In most cases, however, the cost of the project was minimal, and the data generated will be useful and will advance geological understanding (as long as people on site take time to read the report or thesis).

The **ugly**. Well, there have been rare cases over the years of large-scale (large-budget), all-singing and all-dancing, paradigm-changing projects that just fizzled out. Big words can be used in the proposal, big names can be involved, and big outcomes can be promised, only for the projects to underachieve. The failure of large-scale projects can damage the reputation of the institution(s) and can make companies think twice about where (and how much) research funding they make available. There can, of course, be many reasons for this outcome, but key among them is a lack of open and transparent communication. Without mutual trust and respect, there will be

Industry geologists assisting Monash University students during sample collection at the Lorena gold deposit, Cloncurry, northwest Queensland.

no real collaboration, and this is especially pertinent for projects with larger budgets and more participants.

## Final Thoughts

The topic of industry-academic research projects is a large one, and there are some fundamental issues with the way the academic system is funded (e.g., the reliance on citations as a measure of the worth of a researcher). However, until any future changes take effect, I have some final suggestions to maximize the chance that a collaborative industry-academic research project succeeds.

- Pick your research/industry partners carefully and try to establish common goals; not every top academic or mining/exploration company will suit collaborative research.
- Maintain open and transparent communication; building trust and effective communication are vital for a successful collaboration.
- Agree on key deliverables, and then deliver them on time. If plans and timelines change, be open about it.
- For the researcher (and student), think about how to present your results clearly with technical jargon defined and kept to the minimum.
- There are no substitutes for field work and time spent at the operation(s).
- Maintain project flexibility where possible.

Geologists from academia and industry inspecting outcrops with the waste dumps of the Ernest Henry mining operation in the background, Cloncurry, northwest Queensland.

- Try to keep the relationship positive! Industry-academic collaboration is like all successful relationships: you have to keep working at it!

One of the most positive and undervalued outcomes of any research project is the training and experience that it gives to students who are involved. Students are the future of our industry, and they will be making the next round of discoveries. The bigger picture of applied research is that even if this project didn't reach all the goals it aimed for, the next one might, similar to the outcomes of most exploration projects. Adding geological understanding and constraints to exploration campaigns or learning more about the orebody that is being mined and its minerals is fundamental to advancing the minerals industry and finding the orebodies of tomorrow.