

Miles Gould: MathsJam talk 2017 - transcript

[Photo of Miles on the summit ridge of Karga Chokusu, with Peak Constitution on the horizon]

"Climbing a mountain" is often used as a metaphor for any long or challenging task, and a lot of the time it's a pretty bad metaphor. But last year my friend Andy and I made the first ascents of some unclimbed mountains in the former Soviet republic of Kyrgyzstan, and I found the experience surprisingly similar to doing mathematical research. So I'm going to tell you a bit about my trip, and you can see how much of it's familiar.

I was asked two questions over and over again while I was preparing for the trip:

[Slide: "You do this for *fun*?"]

[Slide: "There's still new stuff to be done?"]

And the second question isn't totally unreasonable. Most people have no idea that there are still unclimbed mountains in the world, or that there's still more maths to be discovered. If you're better informed, you might be aware of progress in both fields, but only know about the highlights, like the Dawn Wall or the Poincare Conjecture: hard technical achievements by world experts working at the limit of what's currently possible. But actually, there are still thousands of unclimbed mountains, and... countably?... many unproved theorems, and many of them are accessible to people with only moderate levels of skill. Such as myself.

[Slide: map of Kyrgyzstan, with the Kuluu range marked]

Having realised that this is a thing you can do, you have to pick a general area. I recommend Kyrgyzstan, in central Asia - minimal bureaucracy, Alpine-scale mountains, very friendly. Go and visit even if you're not a climber, it's lovely. But that's still a pretty big area, so you need to identify something that hasn't been done, which means you need to work out what *has* been done. Which means you need to do a literature review. This is made more difficult by people using different names for the same thing, or the same name for different things, or not being clear about what they actually achieved, or not using what you thought were standard notations...

[Slide: photograph of a page of a book, showing a table full of numbers and unexplained Cyrillic abbreviations.]

Once you've done your literature review, you then need to do another literature review, in Russian.

[laughter]

I see we have some algebraic geometers in the house.

[Slide: map of Kandyk valley]

Eventually, you should find some concrete objectives that you think are within your abilities. We picked the Kandyk valley, shown here, which was surrounded by some unclimbed 4000m mountains.

[Slide: sponsors' logos]

Once you've picked a definite objective, you can write to people and ask them for money. Academics will be *extremely* familiar with this step.

[Slide: Andy on the summit of the Arete des Crochues]

All the time, you've been training, and in fact this will be the culmination of a lifetime's training and preparation. You can learn specific technical skills, but mostly you prepare by solving similar real problems with known solutions: that's the only way you can learn to apply your skills in context.

[Slide: Miles pulling on the reins of a reluctant and bag-festooned horse]

Then it's time to start work on your problem. You'll probably have disagreements with your collaborators, when you want to head in one direction and they want to stay where they are and eat grass. OK, maybe that's just a problem in mountaineering.

[Slide: our translator Sergei talking to Kyrgyz shepherds and pointing at a map]

You'll meet people who are already working in the field, and sometimes it can feel like you need to learn a whole new language to communicate with them, and that you don't share any common points of reference.

[Slide: Google Earth view of Objective D, showing gently rounded snow ridge]

Sometimes you'll find that things you thought were going to be straightforward...

[Slide: photo of Objective D, showing extremely spiky rocky ridge]

... turn out to be much harder in reality, and you have to scale your ambitions back.

[Slide: Karga Chokusu, showing the east and west ridges]

Sometimes you pick a promising-looking line of inquiry [indicates west ridge with laser pointer], do some tough work to pursue it, follow it as far as it leads and discover that it doesn't get you where you need to go, and you need to go back and try a completely different approach [indicates east ridge]. Which then turns out to be much easier.

[Slide: Andy lying in a tent and looking miserable]

That's pretty dispiriting.

[Slide: Miles on summit of Tülkü Chokusu, brandishing ice-axe]

But if you persist and succeed, you get an incredible sense of achievement.

[Heckler: who built that cairn?]

It's not a cairn, it's a product of freeze-thaw. It gets very cold in the Tien Shan, especially on the summits of mountains.

[Slide: Andy crossing rainbow screes between Töö Chokusu and Suurdun Chokusu]

And if you stay flexible and look around you, you might notice that an objective you hadn't considered is possible, and is even unexpectedly beautiful.

[Slide: view of the Oroy valley from the summit of Suurdun Chokusu]

And from your new perspective, you can see enticing new objectives for next time. This is the Oroy valley, next door to ours; to the best of my knowledge all of these peaks are unclimbed and unnamed.

[Slide: cover of expedition report]

But you can't go and climb them straight away: first you need to write up what you've done, *as clearly as possible and using standard notation*, so that people can follow you. Ideally you'll get it into a high-impact journal like *Chalkdust*, but you might have to settle for a lower-tier rag like *The Alpine Journal*. Then you can go on the road and tell people about it, as I'm doing now.

[Slide: orographic map of Kuiluu range, with previously-climbed peaks clearly marked]

...and, by the way, this is usually when you find the crucial reference that would have saved you weeks of work back at the beginning.

[Slide: "Thank you! @pozorvlak @AndyMilesExped"]