Finding New Problems to Work On

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Often mathematicians know what problems we would like to solve. If your current idea is working out, congratulations! You can stop reading and go back to writing. If you're still reading, it may be because you are stuck, are out of ideas, or perhaps have just finished a project and are worried that the next one you have in mind is a minor extension of something you already understand.

If you feel stuck, it may help to keep in mind that the reality is that we spend most of our research time failing to solve the problems that interest us the most. It's easy to get frustrated, and often it's not clear what to do next. André Weil [Wei74] famously wrote, "In 1947, in Chicago, I felt bored and depressed and, not knowing what to do, I started reading Gauss' memoirs…" By learning something new at least you can preserve your sanity until progress comes along.

When looking for new directions and inspiration, you should take at least some time to read up a bit and see what seems exciting. Of course, it can feel that it's hard enough to keep up with one's own specialty, let alone read papers in another, and reading the arXiv can seem like drinking from a firehose.

If you decide on spending at least part of your time on a new direction, how important is it to look into those that seem fashionable? Popular areas may seem heavily populated by established mathematicians and their graduate students, and may not always feel welcoming. Try not to be intimidated. Learning about the active researchers and making sure to give them proper credit can go a long way towards becoming part of the community. On the other hand, pursuing something less fashionable takes real guts, particularly at an early stage in one's career. In this case you have the advantage of having more of the field to yourself.

What if you feel you are out of ideas? Fortunately there are plenty of excellent but under-explored ideas of others waiting to be rediscovered in the literature. I always found Raoul Bott's attitude inspirational. Bott didn't seem to view his own results on the topology of Lie groups the result of his own creativity as much as his ability to appreciate Morse's theory, which he called his "secret weapon" [Bes08]. His passion for promoting the ideas of other mathematicians was, I thought, one of the reasons he was so successful.

References

[Bes08] Bestvina M, PL Morse theory. *Math. Commun.*, 13(2):149–162, 2008.
[Wei74] Weil A, *Two lectures on number theory, past and present. Enseign. Math.* 20, 87–110 (1974).

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