Journal of Cell Science

An occasional column, in which Mole and other characters share their views on various aspects of life-science research. Correspondence for Mole and his friends can be sent to **mole@biologists.com**, and may be published in forthcoming issues.

Rabbits' feet and four-leaf clovers II

Well, that didn't go very well. I had a straight to the king, and went all in, but I never saw the four nines lurking in the shadows. I'm busted, so I'll go get a beer, and we can sit outside.

If you're just joining us, we were playing poker with the gang and talking about luck. Why it is that some folks are just lucky doing this biomedical science thing, and most of us bang our heads against experiments, publications and grants, and barely manage (and often go bust). How can *we* get lucky, too?

We all know that some people are very good at doing the science thing, and there must be a secret to this success. Some of it is luck, I suppose. Biology is messy, and we are often *wrong*, even when our logic is solid, because things are simply not simple. But it *can't* all just be luck. Like poker, there are those who seem to hit the jackpot more often than the odds might predict.

I admit it, I'm one of those pretty lucky ones. I can't play poker (not well, anyway) but I do seem to get more than my fair share of nice papers, and I have a job that I love like crazy. People say I'm lucky, even if I can't ever seem to get decent cards. But here's the thing: I can't easily put my finger on what it is that I do that makes things seem to work. But I'm going to try.

And as I often do when I'm faced with a sticky problem like this one, I talk it over with my great friend, Weasel. Weasel is another one of those very lucky ones who has been doing this for a long time, and with great success. He and I get together for tea whenever we can, despite the big ocean separating us. Except that we never drink tea.

Weasel and I agree on many things, and especially this: we don't ever *feel* lucky. In fact, every 'great' idea we have seems to be impossibly hard to prove, and not only do experiments fail (seemingly all the time), but we are both very insecure in our ability to pull off the next big 'thing' (whatever it might be). We regularly bemoan our deep feelings of inadequacy. And I'm sure I'm worse, because he's *so* much smarter than I am. But I'm funnier. (Or maybe not, because he's very funny, and he makes me feel insecure.) But he's my best friend, and besides, we both like to drink 'tea'.

But here's what we've both noticed. More often than not, and despite all the pain and suffering (some of it ours, and much of it our beleaguered trainees'), we somehow pull it off in time. We agree that this is because we've worried ourselves sick over the bits that don't work, and wrangled with the bits that do but don't quite fit. At the end of the day, of course, we present it all as though we *knew* from the start how it would all turn out, but really? We scramble in the dark shouting "Marco" and hoping that we'll hear "Polo" before we stumble too far afield. (If you have never played 'Marco Polo' this will all be rather arcane, but ask your friends to play it with you after a few glasses of 'tea' and you'll see what I mean.)

Of course, its more than worrying over the little bits and problems that makes the science somehow come out okay in the end (not the end really, but at a good stopping point). It helps, a lot, that we asked the right question from the beginning. And maybe this is part of the key to it all: finding what it is that you want to answer. This is one secret, and while you most likely know it, you don't know that you know it.

Many of us start out asking big (or biggish) questions, but then we get bogged down in the details. We *want* to know how something important works, and we understand that the key to this is to understand how one molecule sticks to another, or what goes up or down, or what gets changed. And this is where we run into problems. Because what we expect to happen doesn't, or happens differently, and so we chase after that. And that's okay, because, as Weasel and I both agree, following the data is really important. The alternative is ignoring the data, and just *deciding* what must be correct, and this is the way to fail very miserably, or worse, fill up the literature with things that are wrong (and this is *not* success). But when we follow the data, it is very easy to forget what it was we were trying to do in the first place. Our big question gave way to littler and littler questions, and when we finally answer one of these, we're frustrated and upset that nobody thinks it's very important.

But if you keep the big question in mind, you may find that you've actually made a bigger step than you think you had. The problem is, everyone hasn't had your journey, and it's easy to forget that others aren't following each step of the problem as it develops. So you have to explain it to them. And more than that, you have to do the experiments that show that you've actually answered an important part of the big question, *because you never let the question move out of your focus.*

But what are the big questions? You know what these are. The big questions are *not* 'what bit is modified on protein *x* by protein *y*'. But knowing the answer might be a step towards knowing the answer to the real question you want to answer, and you may have to remind us of why this is the case. You can do this, right?

Okay, we've been talking about big questions and big success, but maybe we need to bring all this down to size. Remember, *our* big question is 'how can I be lucky?' Let's take this step by step.

There are a lot of guides to winning games of chance. I've read books about poker and backgammon, and while I am not accomplished in either, I know that luck has only a very little to do with winning these sorts of games. Yes, the best players can be unlucky, and the worst ones can sometimes win, but in the long run, it is skill that makes the difference. And if you are reading this, you are in for the long run. (Alternatively, you may have picked this up on your friend's coffee table, but if that's the case, I hope you at least got a chuckle out of the cartoon.) Okay, in the spirit of such guides, we can call this 'Mole's Guide to Winning at Science'. (I was thinking of 'Science for Blood', but that's a bit scary.)

Take advantage of what you can control. No matter how much we wish it, we don't know the answers to our questions until we do a lot of hard work, and how it all turns out is outside of our control. But there are a number of things you do control, and you have to ensure that you don't give us this edge – it is one of your few advantages. In this modern era of science we have access to an enormous range of reagents and technologies, but we jinx ourselves if we simply assume that these things all work. When you get a reagent (even one you've used many times), *test it*. Make sure it is working as you expect. When you obtain a DNA construct ('cloning by phone', or at least, by email), sequence it. Make sure it is what you think it is. If you are using a cell line, confirm that it really is the cell you believe it is. When you prepare cells for an experiment, check that they are behaving as they should. Check check check the things you *can* check, so that your experiments don't fail for reasons you could have prevented. That way, you have the best chance of actually being able to repeat your results, and even better, interpret them.

Ask questions that are worth asking. We don't have unlimited time or resources to follow up everything that comes our way. Just because you *can* ask a question, it doesn't mean you should (see above). Weasel and I are both amazed at how often we ask a trainee (or, for that matter, a more experienced scientist) why they are doing a particular set of experiments, to be told that it was because someone else told them to. Or because they had the reagents, or the machine, or the array, or whatever. No wonder that after the hard work, nobody seems to care what they found out.

Do your homework. Just because you can access the literature by internet doesn't mean that you actually know anything. Downloading a paper doesn't count as reading it, even if you looked at the title. Someone (I think it might have been Obi-Wan Kenobi) once said, "Several days at the bench can save you hours in the library". Far too many people seem to take this literally. Don't you be one of them.

Be an expert. Be the world's foremost expert on your own project. Yes, its hard, but who said this was supposed to be easy. Why should anyone else know more about what you have chosen to spend all your available time doing than you? You should be fully versed in every experiment you have done, everything you have read by others, everything you've been told, and everything you've thought about anything that pertains to your work. You are a *professional*. Act like it.

While these suggestions can give you a bit of an edge in succeeding where so many fail, these are really only little things that you probably know anyway. And because of that, many of the other folks who were reading this have already moved on to read other things, which is good, because now I'm going to give the *actual* secret to success. And you are probably the only one who gets to have it. I'm even going to hide it here in this paragraph and not give it any sort of stress, so that it can stay a secret for a bit longer. Be a lightning rod. There, I said it. Go figure – I never thought I'd give this one away.

Every really successful scientist I know is a lightning rod. Real lightning rods are prominently placed conductive thingies that carry electricity efficiently to ground, and therefore lightning strikes them rather than other places. And our scientific lightning rods work similarly. By being an expert, by actually reading the literature, by performing

experiments so that they work (when they *can*), and by asking the really interesting questions, they can sift through the massive quantities of information that comes by in bits and pieces, and take any new findings, ideas or suggestions to ground. They are visible through their well-written papers and well-practiced presentations, and they attract the interest and attention of others who offer advice and their own expertise. They receive research and intellectual help from other experts, because time spent with them (and their questions and projects) is well spent.

Remember: control what you *can* control. You can read, synthesize and develop perceptive viewpoints of important aspects of your field. You can practice and perfect your writing skills, and apply them to writing useful review articles that not only summarize the literature but put it into an informed and informing context. If you have the opportunity to present a talk, prepare and practice it until it is a monument to clarity. Take every opportunity to stand up and stand out, but be fully prepared to capture any stray bits of lightning that may then come, and effectively take them to ground. This only works if you have done all the preparation to not only *seem* like an expert, but actually *be* one.

I may not get the good hands in poker (or know what to do with them when I get them), but I have fantastic luck in working with terrific, interesting and talented trainees and collaborators. I have great luck in finding answers to questions that people appear to find intriguing and important, and amazing luck in publishing them (and, often, getting money to find more). And I plan to do this for a long while, and have a great time doing it. Maybe the secret I told you has nothing to do with it. Maybe I really am just lucky, and the huge amounts of effort I put into what I do are wasted, because I'd be lucky anyway.

And maybe rabbits' feet and four-leaf clovers really will help you be a winner. If anyone asks: *that* must be the secret. Hey, we don't want *everyone* to know, right?

Mole

Journal of Cell Science 123, 2863-2865

doi:10.1242/jcs.078097