Words of Advice: choosing the right lab for your post-doctoral fellowship

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Abstract

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For most researchers, the time they spend as a postdoc stands out as one of challenge, but also enormous personal and professional growth. This *Words of Advice* is intended to guide the choice of post-doctoral position to help make the venture a success and to launch the first chapter of a happy and fulfilling professional life.

**Introduction**

The typical career path in biomedical research commences with formal doctoral studies, followed by a period working as a post-doctoral scientist (‘postdoc’) at a different institution, quite frequently abroad. Here, the postdoc applies lessons learned during their doctorate to a different research topic. This period is one in which an emerging scientist gains experience in initiating and leading a new project, while also transitioning to progressively greater independence. As most postdocs are in their late 20s or early 30s, this time may also be one of significant transition in their personal life – the post-doctoral role may be the first fulltime job they have held; it may involve challenges in language and cultural adaptation; a relocation may involve a life partner whose equally valid career aspirations have to be considered, and young children may need to be resettled without the support of close friends or extended family. In addition, parents or other close relatives back home may already be aged or infirm, or may develop a serious illness during the post-doctoral period.

Moreover, the current, extraordinary situation of having to deal with the stresses and uncertainty of a once-in-a-century global pandemic adds yet further challenges that have to be thought through and dealt with. If all goes well, the emerging scientist will - at the end of this time - be considering a move into their first permanent role in academia or industry, and into a fulfilling and successful career in their chosen field of science.

**Making a start**

Just as a doctoral research plan should be carefully set out in advance, the steps in choosing and preparing for a post-doctoral role (see Box 1 for key points) requires time for careful inquiry – 18 to 24 months is ideal, especially if you wish to apply for your own funding from competitive sources. During your doctoral work, your reading and attendance at seminars and conferences will expose you to countless opportunities for inquiry – what type of research inspires and excites you? Who are the authors and speakers who demonstrate scientific rigour, but also expound a vision for what their work will ultimately achieve? What is likely to be exciting researchers and consumers in 5 or 10 years’ time? What are the disruptive emerging technologies on which progress will depend? An important consideration is whether to stay in the same field or move to a different area of science –
both have their advantages and disadvantages. A new area will no doubt broaden the postdoc’s knowledge base and the skills acquired during doctoral studies may be beneficial for the postdoc’s new lab. Learning something completely new will be exciting, but acquiring new skills will doubtless take some time.

There is plenty that can be done informally in preparation. Your own institution will likely be hosting many postdocs from afar, prepared to share their experience and give advice. Learning first-hand how they are handling the opportunities, stresses and challenges of their new venture, and the level and style of the boss’s support for the postdoc’s project (especially at the very start, or when progress slows, and things aren’t going so well) can be telling, particularly over a moderate span of time. Every time you attend a seminar or visit another lab, you might try to get an impression of what it would be like to work in the presenter’s lab, research a similar topic, or utilise their key technologies. Simple things such as clarity of an oral presentation, ready engagement with junior faculty and students, even how a prospective boss reacts to polite suggestions or reasonable criticism of their work may help you form a view of what it would be like to work with them. Setting aside the practical difficulties of travel during a pandemic, attending organised conferences is generally a rich and efficient way to become exposed to postdoctoral prospects. If you are presenting a short talk, hang around and engage at the end of your session. If presenting a poster, show up on time, relax and engage enthusiastically and openly with anyone who shows interest in your work – a wily potential boss or one of their trusted ‘scouts’ may be taking note.

Choosing a lab and a ‘good’ boss

There is no right or wrong way to start this process – but you will ultimately need to develop a set of criteria to guide your choice of lab/project/principal investigator (PI). Some people develop a burning desire to work in a specific area of research and this may lead them to consider labs in several cities or countries. Alternatively, a particular lab or an inspiring researcher you encounter may cause you to target just one institution – this is fine, as long as there is a ‘plan B’. Not surprisingly, excellent, well-resourced labs tend to generate competition for places. Some aspiring postdocs make a ‘whole of life’ decision and decide to embrace the remarkable opportunity science offers to be immersed in a different language and culture for an extended period of time, while pursuing new scientific goals. Whatever parameters you may wish to set, always also consider how your choice will affect the options you have when your postdoc ends.
Just as any prospective boss will do ‘due diligence’ on you as a serious candidate, it is absolutely mandatory that you do the same. You will already have learnt a lot about your prospective boss’s work from their publications, awards, lectures, social media posts and the information on their webpage, but it is every bit as important to understand how they ‘run’ their lab. Arriving full of enthusiasm and then enduring several years in an unhappy or even combative environment is not only unpleasant, but demoralising, even with a seemingly attractive project. Getting the ‘low down’ on how a lab really operates day to day may not always be simple, but tactful and discrete inquiry will normally get to the information that will mitigate this most serious of risks.

The ‘courtship’ when choosing the postdoc lab
We believe a critical and indispensable enabler in choosing the ‘right’ lab is to visit in person. Ideally, you may even wish to acquaint yourself with your top two choices before you make a final decision, assuming you have two genuine ‘suitors’. Some universities fund their graduate students to attend a national or international conference during the course of their studies, presenting an opportunity to add on such a ‘postdoc tour’.

Make sure that you are well-prepared for the visit – read the recent key papers and reviews from the lab, try to understand/predict their research directions, be prepared with some questions, perhaps propose an idea that is relevant to their work – in other words, demonstrate genuine interest and enthusiasm for working in that group. It is also important to be honest - make sure you are transparent about your technical expertise and research experience. It is much better to be upfront about your limited experience in some techniques, but give examples of other skills you can offer. In this way, your potential boss will suggest a suitable suite of projects for you to consider, and provide appropriate training if needed.

A visit to the lab of a prospective employer provides another crucial opportunity – any boss worth their salt will invite you to give a departmental or lab seminar on your current work. This does not need to be overly formal - but prepare a well-structured and clear talk that leaves plenty of time for discussion and questions. You will be nervous, but avoid the temptation to read a scripted talk, and all the better if you are comfortable with inviting comments and questions ‘as you go’. For a one-hour lecture, plan to speak for no more than 40 or 45 minutes (plan proportionately for shorter talks). Give a brief and digestible introduction so everyone can follow an unfamiliar area of research. Avoid giving enormous detail as this can overwhelm a naïve audience and be boring for some – being logical and clear may be more important to many prospective bosses than tiny intricacies of
your data. Do not inflate the potential outcomes of your work, and be prepared to discuss any limitations and caveats honestly. Sum up and list future studies at the end, and always have additional (non-essential) data cued up beyond your acknowledgment slide - just in case you get a question that demands that data! The discussion period is where you will demonstrate the depth of knowledge of your project and the associated literature, allowing you to shine. Always be generous in acknowledging the contributions of others to your work, especially your current supervisor: your prospective boss may know them well and their opinion on your suitability for the new role will certainly be solicited.

If at all possible, make arrangements to spend at least one, but preferably two full days at the ‘new’ lab, even if you have to pay for a night’s accommodation. You should ask your host lab to prepare a schedule for you, and send a list of researchers you would like to meet, even for just 20-30 minutes. Your inquisitiveness and initiative will be noted – just make sure you know at least a little about each of the researchers you actually meet! Keep brief notes on every meeting and expand on them that evening if necessary – such days are demanding and things will become blurred over time. Ask the boss if it is OK to ask their postdocs and students about their lab experiences, and be immediately concerned if your inquiry is met with a negative attitude.

Having secured this approval, make sure you set aside plenty of time for these discussions, including one-on-one chats over coffee or a beer, where you may gain valuable intelligence on how the lab ‘works’. By the end of your doctorate, you should have a good appreciation of the working environments that you feel comfortable in, and the types of colleague you enjoy the most: they may be quiet and introverted or, in contrast, open and socially vibrant. There is nothing wrong with either, but try to anticipate and avoid obvious personality clashes - you will be spending a very large proportion of available time in the lab, and it is the combination of having an engaging project and positive interactions with your colleagues that will make your post-doctoral experience particularly rewarding.

Ask simple, open-ended and direct questions first, including ‘Are you happy in the lab?’ (Box 2). Ask about the social life of the lab if this is a priority for you. You may then delve into more detailed issues. Does the boss encourage a level of independence that you are comfortable with? Your PhD supervisor may have given you considerable freedom in the conduct of your project, and you may find the opposite scenario stifling and frustrating. If you were ‘coddled’ through your doctorate, you may crave a greater say in how you run your research, but the change may be challenging, so be
prepared. A very important matter to inquire about is the attitude the boss takes when results that don’t necessarily ‘fit’ their pet hypothesis are presented? How open-minded are they? Is genuine advice on career development provided, formally or informally? Are postdocs given ‘exclusive ownership’ of their part of a project area, or are two or more postdocs effectively pitted against each other in a race to get to the ‘answer’ first, a corrosive and dangerous, but not uncommon, practice.

Being a postdoc is very demanding, even soul-destroying at times, and a lab’s culture should provide solace, support and encouragement. Reticence on the part of current staff and graduate students to be open should raise concerns. If possible, you may seek out former members of the lab, and try to make up your mind whether postdocs generally depart that lab with a solid publication record and have moved onto another desirable role. We believe it is imperative that you weigh up the above issues, but rest assured that doing so will not limit your range of good choices.

New or established PI?
Prospective bosses and the labs they lead come in a wide assortment of colours, shapes and sizes. You should consider whether you wish to work in the lab of a senior and accomplished researcher or hitch your star to a bright, highly motivated researcher at an earlier career stage. The former is likely to provide greater security on funding, access to well-equipped technology platforms and established collaborations. Choosing to work with an emerging research leader may present less secure short-term funding, a smaller lab footprint with few embellishments, but the opportunity to make a very significant contribution to someone on their way to a major accomplishment. An established PI is more likely to have collaborated extensively with other group leaders at their institutions than a recently-arrived PI. Researchers running a small lab will often have a lighter administrative load and therefore more time to engage their staff and students, whereas some senior PIs spend most of their time at conferences or serving on peer-review committees.

Settling on the ‘right’ project
Together with the choice of lab environment and supervisor, this is a critically important issue. It goes without saying that projects that do not impress you as being original or innovative, or that do not test an important hypothesis should be resisted. If the project ‘works’, is it likely the outcomes would be published in a high-impact general journal or (at least) a respected specialist journal? Is there some likelihood of a translational or commercial outcome as well as an advance in knowledge? If a project has a strong commercial aspect, will this delay future publications (potentially a key issue
when you start applying for a permanent position)? Is there likely to be competition from other well-
resourced labs? Particularly in an established lab, ‘new’ projects may be aiming to extend an already
published finding, and this may limit the opportunity to make a genuinely seminal discovery.
Balancing this ‘negative’ are some important ‘positives’ – a project of this sort would already be ‘up
and running’, and come with access to a range of validated reagents, technological approaches and
collaborations that reduce the risk of failing to reach the endpoint. At the other end of the risk
spectrum, a brilliant hypothesis may not, by itself, be enough to justify taking it on. How feasible is
the proposed project, especially if it is starting ‘from scratch’? Ambitious new projects are rarely
‘plain sailing’ and you might end up spending several years ‘setting the table’, only for your
successors to reap the benefit in the form of publications and recognition. You will probably have
little control over how credit is apportioned once you leave, and a new postdoc might complete the
final experiments, or the final few requested by manuscript reviewers. There is no ‘right or wrong’
here: you should just be sure to assess and understand the risks of any project you consider, and
then be prepared to live with the consequences. Again, exercise diligence; it helps no-one if it takes
you and your boss a year or more to appreciate the project was not feasible in the first place!

A further important consideration is to determine who will ‘own’ the proposed project. By this, we
mean ‘who else has a significant stake in the outcome, and how will this ultimately affect authorship
on papers, especially the first author position?’ Ideally, as the person who carries out most of the lab
work, you would be the first-listed author, but it is imperative to discuss this and seek a clear
commitment before commencing. This is particularly important if more than one researcher is
initiating the studies – generally speaking, and despite potential short-term gains, we do not view
this as an ideal scenario; rather, one to be avoided. If a graduate student or another postdoc is
involved, there also needs to be absolute clarity on ‘who is doing what’, how key reagents will be
generated and accessed, how data will be shared, and how credit will be apportioned if things go to
plan. The issue of ownership may be particularly salient if you are part of a team effort, and
providing crucial ‘niche’ skill such as informatics or statistics. Completing your postdoc with only a
mid-author paper to your credit may not be an ideal outcome. Having said this, new research
projects frequently take unexpected twists and turns, so all the involved parties must agree to act in
good faith if the relative contributions ultimately turn out to be different from what was expected at
the start. The open and transparent sharing of resources and data is especially important, as a lack
of openness leads to wasted time and effort and can result in a poisonous atmosphere in the
workplace. It is ultimately the PI’s responsibility to ensure such calamity does not occur, but as with
every skill, practitioners vary widely in their capacity to execute.

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Are there sufficient resources?

A further variable with significant bearing on the feasibility and rate of progress of a project is the level of resourcing allocated to it. Clearly, the most important resource issue is the period of funding for your own salary. The very minimum should be two years, and preferably three. It is not unreasonable for a PI to guarantee the first two years’ funding, and to leave the third and any subsequent years to a formal review towards the end of the second year. If your project has built momentum by then, there will be incentive for you and your boss to continue the arrangement to your mutual benefit. As a safeguard, whatever you agree needs to be put in writing – reputable institutions will provide a contract or similar document detailing the term of employment, salary and benefits as well as the more generic conditions of employment, and give you reasonable time to review it. The document, or an accompanying one should list realistic, objective and verifiable research goals and other performance indicators agreed to, and set prospectively.

It is a huge advantage if you can arrive with 1-2 years of independent funding for your salary. With any new project, productivity in the form of major manuscripts or presentations at conferences is unlikely until two or three years after commencing. As for additional help that might be provided in the lab, we believe that during the first few months of any new project, it is best that the postdoc is left to their own devices, familiarising themselves with new tasks, producing and testing reagents, devising and refining new research protocols, rather than having to teach a new research assistant or student. Once the project is up and running and the central methods are well defined, being able to draw on the help of a lab technician or research assistant for routine work can free up time for the postdoc to push forward with the more innovative and challenging experiments, maintaining momentum. The aim should always be to submit a major manuscript before your time in the lab expires, and precious weeks or months can be gained by receiving some support for routine tasks, with advantage for both the postdoc and their boss.

On the path to independence

Successfully completing a post-doctoral fellowship puts an emerging researcher on a solid footing to enjoy an independent and productive career in science (Figure 1). By the completion of the post-doctoral period, and once the resulting papers have been published, most researchers will feel ready to commence a permanent position; however, some may consider spending a second, briefer time abroad in a ‘second postdoc’ role. If a further postdoc is seriously contemplated, we believe there should be a solid reason – one that fits with your overall strategy to achieve the best possible

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permanent appointment. For instance, you may wish to spend a further 12 to 18 months acquiring a specialised skill or, perhaps, some experience in an emerging area of technology – competencies that might give you a useful edge over competitors with a less rounded resumé, or that launch you into your career with a broader range of competencies. If consecutive post-doctoral periods are spent in the same city, your time ‘away from home’ will have extended to 4-5 years, a span of time that may have you contemplating a permanent move, assuming the necessary visa/residency requirements can be met. After five years in one city, especially one that has personal and professional appeal, one would expect that roots will have started to form. If you accept a faculty position ‘away from home’, the two likeliest outcomes are that you will spend your whole career in your adopted environment, or that you will return ‘home’ only to apply for a very senior role.

As in most walks of life, genuine leadership in research requires more than just being technically skilled and savvy in a given field of endeavour. While acquiring scientific acumen and rigour are by far the most important things to be gained from a post-doctoral fellowship, successfully leading your own research group requires a far broader array of skills, some of which may be better learnt through example and experience than in didactic courses. A successful independent researcher will ultimately need to attract and retain their own staff, students and postdocs, and to provide them with their own opportunities for career development. Research is never a one-way street, but ideally, one with ‘give and take’ among the team. You will need to develop good interpersonal and communications skills with staff and senior colleagues. You will need to learn how to write an appealing grant proposal, and how to manage the budget when you succeed. All successful collaborations require skilful negotiation, flexibility and honesty – gaining a reputation for fairness (as distinct to habitually ‘burning bridges’) is priceless as you advance in your career.

A perceptive postdoc will find ways to broaden their skill base and gain valuable experience while also carrying out their laboratory project. After several months of ‘finding your feet’, opportunities will doubtless arise to help your boss with grant-writing, lead or help organise a journal club, chaperone a visiting speaker, supervise junior staff, mentor a junior student (eg a summer student) or take on a minor administrative role relevant to your research. But be cautious - the time and effort devoted to such activities needs to remain modest, and you should seek permission from your boss before you commit. Optimal time management is especially important for clinicians who may wish to continue with part-time clinical work while also pursuing a lab-based project, particularly if they have never worked in a wet lab before. In our experience, at least 80% of available time must be devoted to the lab project, as clinical duties have a tendency to expand over time and most lab
projects have strict time demands. After hours ward service is particularly fatiguing and should be avoided unless the clinical experience gained adds significantly to overall research output (for example, if you are leading clinical trials), or your field is one such as surgery, where it is imperative that you progressively build your technical skills.

Postdocs in the time of SARS-CoV-2

Virtually every aspect of research life became more complex with the advent of SARS-CoV-2 (or spread of the disease COVID-19), particularly if it involves international travel. While acknowledging the clear difficulties, we urge prospective postdocs not to be discouraged and to still explore postdoc opportunities far-afield. The process of tracking down a good postdoc opportunity has a long gestation – certainly long enough to expect that effective vaccine/s and/or COVID-19 therapeutics will emerge in the meantime. Nonetheless, it is inevitable that travel restrictions will have a negative impact and limit employment opportunities (and your ability to assess them) in the short to medium term. Many bosses will elect to hire locally or nationally rather than internationally, given the attendant risks and higher costs. If you are fortunate enough to live in a country that offers diverse opportunities and good funding within its borders, it may be just as well to seek opportunities there as a priority, or at least as a contingency (again, a ‘plan B’). As very few conferences are currently held in person, the opportunity for a chance meeting with a potential boss is much reduced, and identifying a good job prospect and doing your due diligence will be more difficult. You will doubtless rely on video-conferencing, email and telephony to stay in touch – but we urge you not to rule out going abroad just because it is more complex.

At a practical level, travelling abroad at this time demands that you have access to excellent health care for you and your family, and guaranteed funding for health insurance. Living costs abroad (especially food, travel and rent) will diverge from your home country and may be more expensive, so think carefully about the stipend you are offered. You may also wish to explore the practicalities of being able to return home in case of emergency, such as the illness of a close relative. On the positive side, demand (and funding) for some fields of research will doubtless grow, for example in virology, zoonotic diseases, immunology, RNA biology, genomics, public health, epidemiology, pulmonology and experimental therapeutics. If it interests you, consider carefully whether your current set of research skills might be applied in some clever and original way to addressing the needs of the pandemic.

Conclusion

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Despite the current extraordinary challenges, researchers contemplating a postdoc should remain positive, and not forego a good opportunity to work abroad if it arises. You will need to plan well ahead, search diligently both in your own country and abroad, and be especially well organised. Seek help and advice from those you can trust, especially senior colleagues with personal experience of institutes or countries of interest to you, as the chances of visiting a prospective new place of work in person may be limited. Once you track down a short-list of prospects, maintaining open and frank communication with your prospective new boss, and showing initiative, flexibility and creativity will be key.

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JAT and IV discussed and agreed on the scope and style of the manuscript, and co-wrote the text.

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Suggested Reading


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BOX 1 – KEY POINTS FOR SECURING A POST-DOCTORAL POSITION

Allow plenty of time to explore postdoc opportunities – this may be one of the most important personal and professional decisions you will ever make.

Take advantage of every opportunity to think about possible postdoc posts – informal as well as formal.

When considering your new project, also consider how far you may wish to move from the relative comfort of knowing your doctoral topic in detail, and into new territory.

Be just as diligent as any prospective boss is bound to be, in working out if a given institution, PI or project is right for you.

Critically evaluate any position that strongly appeals to you and visit at least your top pick in person.

When you visit, do not become seduced by the excitement of the visit – remain objective as you can and do not be afraid to ask probing questions.

Give a concise and engaging seminar, and engage genuinely with those at your prospective workplace. This trip is not a vacation.

Learn as much as you can about the dynamics of how your prospective lab operates, the PI’s management style and whether previous postdocs have thrived or struggled.

Consider how your choice may ultimately affect future career choices, whether ‘back home’ or elsewhere. But conversely, don’t shy away from risk altogether, or you’ll achieve little.

Take the necessary steps to ensure you and your dependents will live safely and healthily while you are away.
BOX 2 – QUESTIONS TO ASK OF POSTDOCS AND GRADUATE STUDENTS ALREADY PLACED IN A PROSPECTIVE HOST LAB

Was your choice of lab a good one - why?

Is the lab a happy place? Do the postdocs and students celebrate each others’ successes and support each other when things do not go so well?

Do you feel the lab environment supports you in achieving your goals?

Do postdocs typically see out their contract, or is there a lot of turnover in the lab?

How often do you meet the boss to discuss your project? What format does that meeting take?

Is your boss around very much, and is he or she accessible to discuss genuinely important matters?

How does the boss react to ‘positive’ data? And what about apparent setbacks to progress?

What assistance/support is provided for your project? How well funded is the lab, overall and are resources allocated fairly?

Do most postdocs achieve a good paper before they leave? Is authorship generally negotiated fairly, and are such agreements honoured over time?

Do you get to present your own work at conferences, either in poster or oral form?
Do most postdocs part the lab on good terms? Do they generally move onto a good position?

**Figure legend**

**Figure 1**: Undertaking a successful and productive postdoc role is a crucial step towards an independent research career. This diagram offers some thoughts an emerging researcher might consider and weigh up, as they ponder the type of scientific career that is best suited to them.
Personal traits of a good PI
1. Intellectual independence
2. Being a doer/risk taker
3. Creativity/intuition
4. Ability to debate, but see both sides
5. Excellent communicator
6. Personal ambition
7. Loyalty/fairness to colleagues

Pros of taking on research leadership
1. Freedom of choosing your own research directions
2. Building your own lab/team of colleagues and taking responsibility for your staff/students

Cons of taking on research leadership
1. Time-consuming/highly competitive grant funding
2. Lack of financial security (unless funded internally)
3. Stress—publish or perish
4. Difficult to maintain work/life/family balance

Useful steps in the postdoc to lab head transition
1. Gather a broad research experience/knowledge base
2. Learn how to collaborate productively—give and take
3. Obtain experience in student and/or junior staff supervision
4. Propose and deliver a new initiative
5. Apply for independent funding (even a small grant)
6. Take every opportunity to give a presentation or public lecture

Figure 1