Post-PhD Possibilities: Discovering Academic-Adjacent and Skill-Transfer Career Paths

Christopher R. Madan

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Abstract With far more PhDs graduating than academic positions available, we need to challenge the assumption that a PhD traditionally leads to an academic career—either as a guarantee or as a lifelong commitment. This book is comprised of interviews with those thriving in non-academic roles showcasing the many alternatives. From these interviews, I propose that non-academic roles be considered as two broad paths: academic-adjacent careers use research expertise through industry, policy, and publishing and skill-transfer careers, applying transferable abilities like critical thinking. For individuals in career transition, self-reflection and informational interviews help assess fit aligned with personal values. While finding a suitable path is disorienting initially, focusing on versatile PhD competencies reveals alignments with meaningful work beyond academia. Recognising a PhD need not lead to a faculty career opens possibilities to leverage doctoral skills in impactful new contexts.

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C. R. Madan (✉)
School of Psychology, University of Nottingham, Nottingham, UK
e-mail: christopher.madan@nottingham.ac.uk

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What's next after you complete your PhD? Even if you have postponed thinking about careers so far, friends and family have been asking. Rather than being stressed and unsure, in this book we will discover possible career paths that might resonate with you.

This book includes 31 interviews with a focus on those in non-academic positions. But, reality is more complicated than a simple dichotomy. Some interviewees have gone back-and-forth between academia and industry. Moreover, most of the interviewees in "non-academic" positions are still in roles that are part of the broader academic community: They may work at academic societies or journal publishing companies. They may read academic work and inform government or medical policy. They may work within a funding agency and help decide research funding priorities. They may work at a scientific equipment development company and sell equipment that we use within academia—such as eye trackers or brain measurement/stimulation. So many post-PhD job opportunities exist that are academic-adjacent careers.

What is a PhD for?

While a PhD is necessary for a future academic career, i.e. as a university professor, it is not sufficient. Some academics have liked being a principal investigator (PI) to running a small business. A PI typically does not interact with participants or conduct analyses themselves anymore, but instead focuses on the research vision and management. Some of these major responsibilities include applying for grants and leadership responsibilities (Wright & Vanderford, 2017). Within this view, a PhD student likely is not even a "management" role. Nonetheless, many transferable skills can be learned as part of a PhD (Campbell et al., 2005; Barnacle & Dall'Alba, 2011; Sinche et al., 2017; Weber et al., 2018; Reithmeier et al., 2019; Bernery et al., 2022).

Doctoral training should not only be about learning research skills and becoming a topic expert but also developing critical thinking (Schwartz, 2008; Almeida-Souza & Baets, 2012; Yanai & Lercher, 2019, 2020) and improved scientific literacy (Hubbard & Dunbar, 2017). Given how later academic positions diverge from the day-to-day responsibilities of a PhD student, the assumption that a PhD directly leads to a definite career as a university professor needs to be pre-empted by mentors. Moreover, mentors should have open discussions with PhD applicants about their motivations and expectations when pursuing PhD studies (Gibbs & Griffin, 2013; McAlpine & Emmioğlu, 2015; Tsoi et al., 2018; Vanderford et al., 2018; Madan, 2022b).

The mismatch between the rates of new PhD graduates and new faculty positions being created is not necessarily a sign that we should be training less PhD students. If people are willing to learn advanced scientific topics, why is this a problem? This is not to say that we should leave academia as is, there are plenty of ways it can and should be improved—such as improving student mental health (Flamez et al., 2017;

Evans et al., 2018; Moran et al., 2020; Dickerson, 2020; Ayres, 2022; Hall, 2023; Korreck, 2023) and including mentorship training for PhD supervisors (Denicolo et al., 2020; Hinton et al., 2020; Madan, 2021, 2022a; Cao et al., 2022; Ruedas-Gracia et al., 2022; Almlöv & Grubbström, 2023). Instead, as mentors we need to be clearer about the possible career paths upfront and should view academia as a skill-training period and opportunity to contribute to science, but not as a lifelong commitment.

Moreover, academia can involve a diverse range of skills (Sinche et al., 2017; Bernery et al., 2022)—perhaps there is a future where specialisation and larger teams have a place: one individual for science communication across a few research groups, another with statistical expertise alongside some domain knowledge, and a third who is practiced with data documentation and open-science practices. What if these roles are considered part of the "indirect costs" associated with research and underwritten by the university department? We have shared costs for building and equipment maintenance, why not also employ people that can help make our research capabilities greater?

Three Career Paths: Traditional Academic, Academic Adjacent, and Skill Transfer

What is generally viewed as the **traditional** route is to stay in **academia**—looking into teaching or research positions, planning further research studies, grappling with how to find a good potential next position while also moving to another city that's affordable, and how to stay in touch with your family and friends. Unfortunately, positions within academia are quite limited, with far more PhD graduates each year than available job postings (Campbell et al., 2005; Schillebeeckx et al., 2013; Edge & Munro, 2015; McAlpine & Emmioğlu, 2015; Hayter & Park, 2019; Reithmeier et al., 2019; Berdahl et al., 2020; Lu et al., 2023), along with increasing training periods (Kahn & Ginther, 2017; Tsoi et al., 2018; Cheng, 2023) and systematic inequalities in academic progression—including gender, ethnicity, socioeconomic status, and characteristics of doctoral institution (Goulden et al., 2009; Clauset et al., 2015; Collaborative on Academic Careers in Higher Education, 2017; Meyers et al., 2018; Hayter & Park, 2019; Hinton et al., 2020; Morgan et al., 2022; Rennane et al., 2022; Wapman et al., 2022; Zhang et al., 2022; Edwards et al., 2023). Beyond these considerations, academic positions can be quite heterogeneous—with the same job title being associated with varying mixtures of research, teaching, and management responsibilities. Even then, academia has more day-to-day variation than most other careers (Faccio, 2023).

I am putting together this book and writing this introductory chapter from the position of someone in academia with a permanent position, but also as someone who wants to make sure that those planning or finishing a PhD are able to make an informed decision. Staying in academia almost requires you to move around the

world several times—this may not be an option given other life commitments. Personally, I am living in my fourth country now (Canada, Germany, the USA, and the UK). Even if it is a viable option or can be "planned around", academia asks a lot of us in many ways. PhD supervisors are responsible for facilitating the career development of those they supervise (Concordat to Support the Career Development of Researchers, 2019; Berdahl et al., 2020; Denicolo et al., 2020; Madan, 2021, 2022a, b).

Often, it is discussed that the other path is "not academia". However, this is a false dichotomy—the number of positions in academia and non-academia is far from balanced. In interviewing people for this book and the previous volume, I see two paths that both fall under non-academic careers. Many of those I interviewed are still part of the broader academic community, working at funding agencies, developing government policies, working for companies that make specialised research equipment, and developing training courses. In these interviews, a more accurate term has come up for these positions—"academic-adjacent careers" (Madan, 2022a).

Doctoral training involves developing in three categories: topic, methods, and general. Topic is what you study—I study memory. Others have studied music cognition, perceptual expertise, or moral decision-making. Methods are what approaches you use to study them—programming experiments, doing brain imaging analyses, and conducting interviews—all of these are methods. General doctoral skills include technical writing, giving presentations, working as part of a team, and managing projects. All of these are skills developed through a PhD but are distinct from the topic or methods. Those in **academic-adjacent** roles are using topic and/or methods skills in their new "non-academic" role. Thus, academic-adjacent, non-academic, and alt-academic are not synonymous terms—rather, these are different framings of using doctoral training outside of working at a university.

However, not all of those interviewed are using PhD topic or method skills in their subsequent role, but are still benefitting from more general skill development associated with their PhD (Campbell et al., 2005; Barnacle & Dall'Alba, 2011; Sinche et al., 2017; Reithmeier et al., 2019; Berdahl et al., 2020; Bernery et al., 2022). Careers prioritising data science, project management, or technical writing are relying on these more general doctoral skills—here I am suggesting we refer to these as "**skill-transfer** careers". These individuals take skills developed during their PhD into another context where they are transferable and highly valued (Vitae, 2012; Sinche, 2018; National Science Foundation, 2023). It can nonetheless be a challenge to convey to a hiring manager how a PhD is a benefit for the role you are applying for (Hancock et al., 2017; Cornthwaite, 2021; Persson, 2021; Ward, 2021; Skakni et al., 2022). Two general tips are to prepare a position-specific tailored resume instead of an academic CV and to learn the relevant languages (e.g. in user experience research—terms such as user journey, persona, and prototype are common).

The Book Series

The two volumes of this book series comprise over 50 interviews. Most of the individuals interviewed in this book series completed their PhD in Psychology or Neuroscience. However, it is worth acknowledging that these are broad disciplines themselves. Psychology can span from humanities approaches, such as interviewing special populations and ethnographic research questions, to experiments with humans or animals to study behavior, to more data science focused on working with large data from a brain imaging dataset—perhaps without having collected any primary data. As such, there is a breadth of research approaches underlying the interviewees' PhD experiences—though interviews occurred opportunistically, people who I have met at conferences overlapped with in my own career path or otherwise sought out based on their career (e.g. someone with a PhD that works in a specific industry setting).

The reaches by which psychology interfaces with other fields have led to psychology being described as a hub science (Cacioppo, 2007, 2013), and the recent expansion of large datasets and secondary data has further cemented this (Nosek et al., 2015; Madan, 2016, 2022c; Hesse, 2018; Bainbridge et al., 2022). Neuroscience overlaps with some of these domains, but then further includes additional bench skills and related topics, such as understanding biochemical pathways, patch-clamp techniques, and histology.

The first volume ("Navigating life after a PhD"; Madan, 2022a) included 22 interviews. 9 of the interviews were with academics, while 13 with non-academics. Of the non-academics, many are still part of the broader academic community—academic publishing (StavroulaKousta, ArfonSmith), government policy (Andrew DeSoto), scientific equipment sales (Cleyde Helena), research infrastructure (Ana Van Gulick, Aaron Moss), industry research (Matt Wall, Alice Kim), intellectual property law (Anastasia Greenberg), skill training (MairaQuintanilha), and knowledge translation (Alice Kim, Jens Foell, Alison Caldwell). Apart from these academic-adjacent roles, there are also jobs that use doctoral skills in other contexts, such as data science (Joe Moran) or project management (Arfon Smith). This summary, however, loses the individual perspectives and value of these interviews. Paths to the same job sector and the advice they offer can be quite different—three interviewees were founders and Editor-in-Chief's of three journals (StavroulaKousta, Arfon Smith, SimineVazire), but their paths have been very different.

Based on knowledge gained through my own experiences and in conducting the interviews from this first volume, I have given presentations at universities in the UK, Canada, and the USA about career paths. This has included being on career panels for the annual meetings of the Cognitive Neuroscience Society and Psychonomic Society. This spurred me on further—to conduct more interviews with those in non-academic careers.

This second volume ("A PhD is not a commitment to academia"; this book) includes 31 interviews, all with experience in non-academic roles. Broadly, many of the new interviewees could be categorised as similar topics—government policy

(TommiHimberg), funding agency (Katie Askew, Crystal Lantz), academic community building (Helena Ledmyr), scientific equipment sales (Ben Toovey, Tracy Warbrick), research infrastructure (within a university: Andrew Rowe, Donna Palmer; research software: Rebecca Hirst, Jade Pickering, Vijay Iyer), industry research (Kirsten Smayda, Veronika Vilgis), skill training (Sarah Treit), and knowledge translation (Elodie Chabrol). Skill-transfer careers include using data science in non-academic contexts, such as anti-money laundering (Sebastian Similä) and police services (Emily Batty), or in a large supermarket (Damien Neadle).

Insights into Academic-Adjacent and Skill-Transfer Career Paths

In conducting the interviews that comprise this volume, I have noticed re-occurring underlying themes that came up in multiple interviews. There are several ways to learn more about non-academic jobs—applicable to both academic-adjacent and skill-transfer career paths. Informational interviews, such as those in this volume, are very helpful in providing initial insights. Below I list the questions consistent in all interviews here.

1. Can you introduce yourself and tell me a bit about your current position?
2. What was the focus of your PhD? *(mention when, where, department).*
3. As you were finishing your PhD, what were you thinking about your career plans?
4. How have your career plans changed as you've continued on to your current position?
5. Can you tell us a bit about what day-to-day life is like in your current position?
6. What do you like most about your work?
7. And what do you like least about your work?
8. How do you think having a PhD has helped you succeed in your current position?
9. If someone currently finishing their PhD was considering a position similar to yours, how might they decide if it would be a good fit?
10. If someone was interested in pursuing a similar career path, what would you suggest they do to better prepare themselves?
11. A lot of people like academia because they feel it gives them an opportunity to work on a topic that they deeply care about. Do you think this is also true in your current position?
12. Another reason many like academia is that they feel it provides them with more freedom than they think they would get in other positions. How much freedom do you feel you have to work on what you think is interesting?
13. Have you thought about returning to academia?
14. Based on your journey, what advice or suggestions do you want to pass on to someone who's currently finishing their PhD?
15. Is there anything else you'd like to tell someone reading this interview?

However, your own values may make other questions pertinent, such as the work-life balance, hour flexibility, and considerations of where the workplace is located. For instance, within the USA, there is a large degree of heterogeneity in state-level laws related to identity and expression. Conducting further informational interviews with colleagues you've met at conferences or more senior PhD student cohorts can be a great way to gain a better understanding of potential career paths. Internships can be a way to gain more depth of experience in exploring career options. The goal here is to gain insights into potential roles, understand job prerequisites, and get a feel for different industry sector cultures.

Leaving academia does not mean you have to give up your topics of passion and expertise. While the freedom and passion associated with academia are often romanticised, they might not always meet one's expectations. Nevertheless, skills honed during doctoral training—such as analytical abilities, critical thinking, project management, and communication—are invaluable across a breadth of roles, in and outside of academia. Many find a home in industry, non-profit, or government jobs, cherishing the supportive teams, autonomy, work-life balance, and joy of being a part of creating tangible outcomes.

It's imperative to reflect on one's values, priorities, and interests when considering career paths. There's a vast world beyond academia that might be a better fit for many. Prior choices are not a commitment to a specific path—transitioning between sectors is always an option and leaving academia is often the more sensible approach. It's also advisable for PhDs to highlight their transferable skills, gain experience early on, strategise their networking, and always bear in mind that a PhD is a testament to their capabilities, making them suitable for a variety of roles.

Advice for Individuals

It is important to consider your personal values and life considerations when evaluating job options. Some of these include work-life balance and job availability. Academia offers flexibility in working hours, but is difficult to step away from. The academic job market is stressful—often sparse in new positions. Jobs can vary in their rate of progress; academia typically involves a narrow focus with projects that take years to complete (from inception to publication), with little real-world impact. Geographic restrictions are also a limitation of academic jobs; universities are often located few and far between, with hiring priorities varying from year to year. Priorities also change over time—especially in relation to major life events such as getting married and having children. These major life events particularly have direct influences on work-life balance, geographic restrictions, as well as financial factors (e.g. stability).

Leaving academia can be difficult. It often becomes viewed as a core aspect of one's identity, but people are multifacted and have other talents and interests. Nonetheless, changing career focus is disorienting, and these feelings should be

validated and viewed with self-compassion. Friends made during PhD studies can still be a support network. Focusing on personal values can be important in determining priorities going forward. Academia is just one potential path of many.

Advice for Institutions

PhD programs can try to alleviate some of these anxieties and concerns. Workshops cantered on transferable skills (e.g. project management, data visualisation, and science communication) can help prepare students for skill-transfer careers. Providing support for finding and exploring industry internships will also help students see the value in the expertise in other work settings. Inviting alumni to visit and talk to current PhD students can also make these career paths appear more approachable. Guidance on applying for non-academic roles (e.g. resume vs. CV, portfolios) can also be beneficial.

While the interviewees are in non-academic roles, most of these are still academia adjacent. These careers are still part of the broader academic community and interact with academics on a regular basis. PhD programs should highlight these career paths, where PhD is still very applicable, such as in industry research and science policy, where research skills and subject expertise remain highly valuable. Academic-adjacent careers provide opportunities to collaborate with and positively impact the academic community, even if not directly as an academic. Encouraging informational interviews and job shadowing with people in these academic-adjacent roles directly shows how research skills are valued and applied in these positions. The breadth of academic-adjacent options allows PhDs to find alignments with their specific skills, interests, and values; there are many potential good fits. Pursing an academic-adjacent career can be viewed as building upon one's doctoral training, not abandoning it. It leverages their graduate education in a new context. The goal is conveying that research-related non-academic careers allow PhDs to continue doing meaningful, impactful work that builds on their graduate training. They are a natural continuation of the PhD journey, not an off-ramp. (Additional, complementary resources have been made available at https://worldbeyond.ac.)

Conclusion

In exploring career paths after a PhD, it becomes clear there are opportunities beyond the traditional academic route. Many fulfilling roles exist that allow PhDs to continue applying their expertise, though perhaps in a different context. Academic-adjacent careers provide chances to collaborate with academia through industry research, policy, publishing, and more. Skill-transfer careers make use of transferable abilities honed during doctoral training, like critical thinking and project management. While leaving academia can be disorienting initially, focusing on personal

values and interests helps reveal alignments with these alternative paths. They should be seen as a natural continuation of the PhD journey. With an abundance of options, through informational interviews and self-reflection, PhDs can find non-academic careers where their passions, talents, and training remain relevant. The key is recognizing that a PhD need not be a lifelong commitment to academia; there are many ways to leverage and build upon that education. With an open mind to possibilities, PhDs can find pursuits where they continue doing impactful work that resonates with who they are.

References

Almeida-Souza, L., & Baets, J. (2012). PhD survival guide: Some brief advice for PhD students. *EMBO Reports, 13*(3), 189–192. https://doi.org/10.1038/embor.2012.15

Almlöv, C., & Grubbström, A. (2023). 'Challenging from the start': Novice doctoral co-supervisors' experiences of supervision culture and practice. *Higher Education Research & Development, 1–15*. https://doi.org/10.1080/07294360.2023.2218805

Ayres, Z. J. (2022). *Managing your mental health during your PhD: A survival guide*. Springer. https://doi.org/10.1007/978-3-031-14194-2

Bainbridge, W., Schertz, K., & Veillette, J. (2022). *Big data in the psychological sciences @ UChicago*. 10.17605/OSF.IO/HZ843.

Barnacle, R., & Dall'Alba, G. (2011). Research degrees as professional education? *Studies in Higher Education, 36*(4), 459–470. https://doi.org/10.1080/03075071003698607

Berdahl, L., Malloy, J., & Young, L. (2020). Faculty perceptions of political science PhD career training. *Political Science & Politics, 53*(4), 751–756. https://doi.org/10.1017/S1049096520000839

Bernery, C., Lusardi, L., Marino, C., Philippe-Lesaffre, M., Angulo, E., Bonnaud, E., Guéry, L., Manfrini, E., Turbelin, A., Albert, C., Arbieu, U., & Courchamp, F. (2022). Highlighting the positive aspects of being a PhD student. *eLife, 11*, e81075. https://doi.org/10.7554/eLife.81075

Cacioppo, J. (2007). Psychology is a hub science. *APS Observer, 20*(3), 3–52.

Cacioppo, J. T. (2013). Psychological science in the 21st century. *Teaching of Psychology, 40*(4), 304–309. https://doi.org/10.1177/0098628313501041

Campbell, S. P., Fuller, A. K., & Patrick, D. A. (2005). Looking beyond research in doctoral education. *Frontiers in Ecology and the Environment, 3*(3), 153–160. https://doi.org/10.1890/1540-9295(2005)003[0153:LBRIDE]2.0.CO;2

Cao, X. E., Liu, X., & Zhang, Y. (2022). Flourishing as international students and scholars in the US. *Matter, 5*(3), 768–771. https://doi.org/10.1016/j.matt.2022.02.004

Cheng, S. D. (2023). What's another year? The lengthening training and career paths of scientists. *PLoS One, 18*(5), e0285550. https://doi.org/10.1371/journal.pone.0285550

Clauset, A., Arbesman, S., & Larremore, D. B. (2015). Systematic inequality and hierarchy in faculty hiring networks. *Science Advances, 1*(1), e1400005. https://doi.org/10.1126/sciadv.1400005

Collaborative on Academic Careers in Higher Education. (2017). *Year in Review*. Harvard Graduate School of Education. https://coache.gse.harvard.edu/publications/2017-yezaar-review-collaborative-academic-careers-higher-education

Concordat to Support the Career Development of Researchers. (2019). https://researcherdevelopmentconcordat.ac.uk/wp-content/uploads/2022/01/Researcher-Development-Concordat_Sept2019-1.pdf

Cornthwaite, C. (2021). *How to turn a Ph.D. into a nonacademic career*. Inside Higher Ed. https://www.insidehighered.com/advice/2021/04/29/advice-leveraging-your-phd-successful-nonacademic-career-opinion

Denicolo, P., Duke, D., & Reeves, J. (2020). *Supervising to inspire doctoral researchers*. SAGE Publications Ltd. https://doi.org/10.4135/9781526483072.

Dickerson, D. (2020). I wish I'd taken my mental health more seriously in grad school. *Science*. https://doi.org/10.1126/science.caredit.aba7375

Edge, J., & Munro, D. (2015). *Inside and outside of the Academy: Valuing and preparing PhDs for careers.* Conference Board of Canada. https://www.conferenceboard.ca/edu/research/valuing-preparing-phds-for-careers

Edwards, K. A., Acheson-Field, H., Rennane, S., & Zaber, M. A. (2023). Mapping scientists' career trajectories in the survey of doctorate recipients using three statistical methods. *Scientific Reports, 13*(1), 8119. https://doi.org/10.1038/s41598-023-34809-1

Evans, T. M., Bira, L., Gastelum, J. B., Weiss, L. T., & Vanderford, N. L. (2018). Evidence for a mental health crisis in graduate education. *Nature Biotechnology, 36*(3), 282–284. https://doi.org/10.1038/nbt.4089

Faccio, G. (2023). One job wasn't enough. *Science, 380*(6648), 982–982. https://doi.org/10.1126/science.adi9031

Flamez, B., Lenz, A. S., Balkin, R. S., & Smith, R. L. (2017). Staying well throughout the dissertation process. In *A Counselor's guide to the dissertation process where to start & how to finish* (pp. 17–28). American Counseling Association. https://doi.org/10.1002/9781119375500.ch2

Gibbs, K. D., & Griffin, K. A. (2013). What do I want to be with my PhD? The roles of personal values and structural dynamics in shaping the career interests of recent biomedical science phd graduates. *CBE—Life Sciences Education, 12*(4), 711–723. https://doi.org/10.1187/cbe.13-02-0021

Goulden, M., Frasch, K., & Frasch, M. A. (2009). *Staying competitive: Patching America's leaky pipeline in the sciences*. Center for American Progress. https://www.americanprogress.org/article/staying-competitive/

Hall, S. (2023). A mental-health crisis is gripping science—Toxic research culture is to blame. *Nature, 617*(7962), 666–668. https://doi.org/10.1038/d41586-023-01708-4

Hancock, S., Hughes, G., & Walsh, E. (2017). Purist or pragmatist? UK doctoral scientists' moral positions on the knowledge economy. *Studies in Higher Education, 42*(7), 1244–1258. https://doi.org/10.1080/03075079.2015.1087994

Hayter, C. S., & Parker, M. A. (2019). Factors that influence the transition of university postdocs to non-academic scientific careers: An exploratory study. *Research Policy, 48*(3), 556–570. https://doi.org/10.1016/j.respol.2018.09.009

Hesse, B. W. (2018). Can psychology walk the walk of open science? *American Psychologist, 73*(2), 126–137. https://doi.org/10.1037/amp0000197

Hinton, A. O., Vue, Z., Termini, C. M., Taylor, B. L., Shuler, H. D., & McReynolds, M. R. (2020). Mentoring minority trainees: Minorities in academia face specific challenges that mentors should address to instill confidence. *EMBO Reports, 21*(10), e51269. https://doi.org/10.15252/embr.202051269

Hubbard, K. E., & Dunbar, S. D. (2017). Perceptions of scientific research literature and strategies for reading papers depend on academic career stage. *PLoS One, 12*(12), e0189753. https://doi.org/10.1371/journal.pone.0189753

Kahn, S., & Ginther, D. K. (2017). The impact of postdoctoral training on early careers in biomedicine. *Nature Biotechnology, 35*(1), 90–94. https://doi.org/10.1038/nbt.3766

Korreck, K. (2023). How I managed my intense burnout. *Nature*. https://doi.org/10.1038/d41586-023-01625-6

Lu, J., Velten, B., Klaus, B., Ramm, M., Huber, W., & Coulthard-Graf, R. (2023). The changing career paths of PhDs and postdocs trained at EMBL. eLife, 12, e78706. https://doi.org/10.7554/eLife.78706

Madan, C. R. (2016). *The hidden benefits of open data*. https://web.archive.org/web/20230326105623/https://medium.com/@cMadan/the-hidden-benefits-of-open-data-60a3648c36b5

Madan, C. R. (2021). A brief primer on the PhD supervision relationship. *European Journal of Neuroscience, 54*(4), 5229–5234. https://doi.org/10.1111/ejn.15396

Madan, C. R. (Ed.). (2022a). *Academia and the world beyond, Vol. 1: Navigating life after a PhD*. Springer. https://doi.org/10.1007/978-3-030-82606-2.

Madan, C. R. (2022b). Approaching the PhD thesis and viva: Clarifying expectations and enhancing preparations. *Cognitive Psychology Bulletin, 1*(7), 46–48. https://doi.org/10.53841/bpscog.2022.1.7.46

Madan, C. R. (2022c). Scan once, analyse many: Using large open-access neuroimaging datasets to understand the brain. *Neuroinformatics, 20*(1), 109–137. https://doi.org/10.1007/s12021-021-09519-6

McAlpine, L., & Emmioğlu, E. (2015). Navigating careers: Perceptions of sciences doctoral students, post-PhD researchers and pre-tenure academics. *Studies in Higher Education, 40*(10), 1770–1785. https://doi.org/10.1080/03075079.2014.914908

Meyers, L. C., Brown, A. M., Moneta-Koehler, L., & Chalkley, R. (2018). Survey of checkpoints along the pathway to diverse biomedical research faculty. *PLoS One, 13*(1), e0190606. https://doi.org/10.1371/journal.pone.0190606

Moran, H., Karlin, L., Lauchlan, E., Rappaport, S. J., Bleasdale, B., Wild, L., & Dorr, J. (2020). Understanding research culture: What researchers think about the culture they work in. *Wellcome Open Research, 5*, 201. https://doi.org/10.12688/wellcomeopenres.15832.1

Morgan, A. C., LaBerge, N., Larremore, D. B., Galesic, M., Brand, J. E., & Clauset, A. (2022). Socioeconomic roots of academic faculty. *Nature Human Behaviour, 6*(12), 1625–1633. https://doi.org/10.1038/s41562-022-01425-4

National Science Foundation. (2023). *Survey of doctorate recipients (SDR) 2021*. https://ncses.nsf.gov/surveys/doctorate-recipients/2021

Nosek, B. A., Alter, G., Banks, G. C., Borsboom, D., Bowman, S. D., Breckler, S. J., Buck, S., Chambers, C. D., Chin, G., Christensen, G., Contestabile, M., Dafoe, A., Eich, E., Freese, J., Glennerster, R., Goroff, D., Green, D. P., Hesse, B., Humphreys, M., et al. (2015). Promoting an open research culture. *Science, 348*(6242), 1422–1425. https://doi.org/10.1126/science.aab2374

Persson, T. (2021). 'Can you work with less-qualified people?' And 19 other curveball questions to navigate at industry interviews. *Nature*. https://doi.org/10.1038/d41586-021-00042-x

Reithmeier, R., O'Leary, L., Zhu, X., Dales, C., Abdulkarim, A., Aquil, A., Brouillard, L., Chang, S., Miller, S., Shi, W., Vu, N., & Zou, C. (2019). The 10,000 PhDs project at the University of Toronto: Using employment outcome data to inform graduate education. *PLoS One, 14*(1), e0209898. https://doi.org/10.1371/journal.pone.0209898

Rennane, S., Acheson-Field, H., Edwards, K. A., Gahlon, G., & Zaber, M. A. (2022). Leak or link? The overrepresentation of women in non-tenure-track academic positions in STEM. *PLoS One, 17*(6), e0267561. https://doi.org/10.1371/journal.pone.0267561

Ruedas-Gracia, N., Botham, C. M., Moore, A. R., & Peña, C. (2022). Ten simple rules for creating a sense of belonging in your research group. *PLoS Computational Biology, 18*(12), e1010688. https://doi.org/10.1371/journal.pcbi.1010688

Schillebeeckx, M., Maricque, B., & Lewis, C. (2013). The missing piece to changing the university culture. *Nature Biotechnology, 31*(10), 938–941. https://doi.org/10.1038/nbt.2706

Schwartz, M. A. (2008). The importance of stupidity in scientific research. *Journal of Cell Science, 121*(11), 1771–1771. https://doi.org/10.1242/jcs.033340

Sinche, M. V. (2018). *Next gen PhD: A guide to career paths in science*. Harvard University Press.

Sinche, M., Layton, R. L., Brandt, P. D., O'Connell, A. B., Hall, J. D., Freeman, A. M., Harrell, J. R., Cook, J. G., & Brennwald, P. J. (2017). An evidence-based evaluation of transferrable skills and job satisfaction for science PhDs. *PLoS One, 12*(9), e0185023. https://doi.org/10.1371/journal.pone.0185023

Skakni, I., Inouye, K., & McAlpine, L. (2022). PhD holders entering non-academic workplaces: Organisational culture shock. *Studies in Higher Education, 47*(6), 1271–1283. https://doi.org/10.1080/03075079.2021.1876650

Tsoi, M., Teitge, B. D., Madan, C. R., & Francescutti, L. H. (2018). Personal values influencing career path in academic medicine: Perspectives of selected Canadian trainees. *F1000Research, 5*, 1903. https://doi.org/10.12688/f1000research.9026.2

Vanderford, N. L., Evans, T. M., Weiss, L. T., Bira, L., & Beltran-Gastelum, J. (2018). Use and effectiveness of the individual development plan among postdoctoral researchers: Findings from a cross-sectional study. *F1000Research, 7*, 1132. https://doi.org/10.12688/f1000research.15610.2

Vitae. (2012). *Employability lens on the vitae researcher development framework*. https://www.vitae.ac.uk/vitae-publications/rdf-related/employability-lens-vitae-researcher-development-framework-rdf

Wapman, K. H., Zhang, S., Clauset, A., & Larremore, D. B. (2022). Quantifying hierarchy and dynamics in US faculty hiring and retention. *Nature, 610*(7930), 120–127. https://doi.org/10.1038/s41586-022-05222-x

Ward, J. (2021). *Three hard truths I learned before moving to a non-academic career*. Times Higher Education. https://www.timeshighereducation.com/career/three-hard-truths-i-learned-moving-non-academic-career.

Weber, C. T. et al. (2018). *Identifying transferable skills and competencies to enhance early-career researchers employability and competitiveness*. European Council of Doctoral Candidates and Junior Researchers. https://doi.org/10.5281/zenodo.1299178.

Wright, C. B., & Vanderford, N. L. (2017). What faculty hiring committees want. *Nature Biotechnology, 35*(9), 885–887. https://doi.org/10.1038/nbt.3962

Yanai, I., & Lercher, M. (2019). Night science. *Genome Biology, 20*(1), 179. https://doi.org/10.1186/s13059-019-1800-6

Yanai, I., & Lercher, M. (2020). Renaissance minds in 21st century science. *Genome Biology, 21*(1), 67. https://doi.org/10.1186/s13059-020-01985-6

Zhang, S., Wapman, K. H., Larremore, D. B., & Clauset, A. (2022). Labor advantages drive the greater productivity of faculty at elite universities. *Science Advances, 8*(46), eabq7056. https://doi.org/10.1126/sciadv.abq7056