

FACILITATING POST-PhD
CAREERS
IN THE LIFE SCIENCES



Facilitating Post-PhD Careers in the Life Sciences

Authors: Jaishree Srinivasan, Shantala Hari Dass, Aditya Parekh

Concept: Shantala Hari Dass

Editing: Ankita Rathore and Karishma S Kaushik

Illustrations and Layout: Manoj Rangan



Date of publication:
1st September, 2023



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What ails Indian Life Science PhDs?

A PhD degree is coveted the world over for its prestige and as a basic requirement for a career in academia, allowing one to step into a world of independent research. However, this does not negate the fact that earning a PhD is also often marked by dissatisfaction. As graduate students over the world ceaselessly discuss the problems inherent in the education system, Indian graduate students, particularly in the life sciences are no exception. A 2019-2020 AISHE report highlights the enrolment patterns in India, with a majority of PhDs enrolled in Engineering and Technology, followed by Science (52478 versus 50936 students). Covering the different Life Sciences and allied subjects (Biotechnology, Biochemistry, Microbiology, Life science, Bioscience, Genetics, Zoology, and Botany), the total PhD enrolment as per the student's response was 15,226.

According to a recent Nature report, a third of the students responding to Nature's 2022 global graduate-student survey appeared somewhat unenthusiastic about their program. While a majority (66%) of the graduate students (both master's and PhDs) felt that their degree would substantially improve their job prospects, the remaining respondents reported little or no benefits. Fewer than 30% felt that their program would help them find a permanent position or equip them with a satisfying career. While the results indicated that 75% of PhD students were satisfied with their decision to pursue a PhD and 71% were satisfied with their experiences, a deeper examination exposed concerns pertaining to career uncertainty, achieving a work-life balance, and problems with funding. Considering that a PhD program typically consumes 4-7 years of a researcher's life, the expectations from the degree can often go unmet.

Traditionally, PhDs have been and continue to be seen as the pathway to a tenure-track academic career, but this mindset has been changing in recent times. Only a minority of PhD graduates (<10%) can expect to secure positions as tenure-track faculty in research-intensive universities, and at least 84% of current PhD graduates need to find non-academic careers, despite the perceived stigma that continues to be associated with these careers. It's interesting that while graduate students bemoan the lack of exciting career options after completing their degrees, reports also suggest that principal scientists and team leaders in institutes often struggle to find suitable candidates to fill their postdoctoral positions. Previous interactions between IndiaBioscience and PhD students indicate a growing trend of moving away from academia and exploring other avenues, while others have emphasized the scarcity of tangible opportunities and lack of awareness related to diverse career options. In recent times, attempts have been made to address this problem through showcasing a diversity of career opportunities (including non-academic ones), such as the Crafting Your Career (CYC) project by IndiaBioscience,

which encompasses workshops and resource materials, as well as the e-book “DISHA,” a comprehensive guidebook for exploring diverse career paths in the life sciences. Additionally, the recently published e-book “I Realised I Wasn’t Interested” showcases professional role models who built non-academic career paths after completing their PhDs.

IndiaBioscience initiated this thought-piece to get a pulse on the problem that ails PhDs in the life science community in India, to better understand their hopes for the future, and importantly, solicit the recommendations for changes in the ecosystem. While none of the issues showcased here are new, having been highlighted in our previous surveys and interactions, it was important to take stock of the situation anew. This piece aims to highlight the current problems and potential short/long-term approaches needed to rein in the issues. Some of the focal areas of concern that emerged from this exercise include the imminent need for a career placement cell and the necessity to reevaluate current PhD degree programs. These programs often demand high-impact publications without adequately preparing students or providing them with supportive networks throughout their program.

Navigating a rough path

Over the years, IndiaBioscience has led and been a part of multiple interactions with PhD researchers. Several of these brought forth the roadblocks that need to be surmounted in the course of the 5-7 years it takes to earn a PhD in biosciences in India. Despite the obvious advantages of a robust curriculum and strong research ecosystem in a premier institute, the research training is more often than not very narrow in scope being restricted to the research problem. The absence of broad-based training is often cited as the primary reason for the lack of preparedness to face the real world after the completion of the degree. This is compounded by the current emphasis on high-quality publications that frequently precludes a broad training approach and also results in a protracted graduate stint. Rather than preparing students with a robust scientific temper and skill sets that would help them transition smoothly to the next step in their career, students often find themselves floundering at the end of their degree.

A few students also opined that the publication requirement empowered their principal instructors/mentors with disproportionate power over their future. The tough path to a PhD certainly does not seem to be made any easier with the delayed or untimely disbursement of monthly student fellowships.

Facing an uncertain future

Several graduate students we met admitted to facing uncertainty as they neared the end of their long PhD journey. While for some, academia appears to be a choice, for many, it often becomes a default option - a result of conditioning that labels them as failures if it is a road they do not end up taking. Faculty members may equally be guilty of perpetrating this mindset of being successful only in the event of pursuing an academic career in the strictest sense. The lack of institutional career placement cells for awareness or training in varied science jobs is a hindrance for students in assessing their career options. Currently, only a minority of institutes in India have a dedicated career center actively engaged in training or arranging interactions with scientific professionals involved in different aspects of science. While a robust networking system is usually involved in the placement of students as postdoctoral fellows, this is notably missing in the case of placement in industry or in the process of choosing non-academic career options. Lack of awareness of potential career trajectories for science graduates appears clearly to be a problem. In the course of training for a PhD, despite a narrow focus, several transferable skills are acquired by students, especially in the field of research that fail to get leveraged or showcased adequately while transitioning to the next step in their careers. Even those pursuing an academic career often end up choosing postdoctoral opportunities overseas that offer better publication prospects, a requirement for chasing academic positions in India. Few Indian universities make it to the charts of world university rankings owing to various reasons. Several of the leading Indian institutions today, whether IISc or some of the IITs appear to attract, hire and retain fairly large numbers of foreign PhDs and postdocs.

Students often struggle to meet the stringent publication requirements for prestigious faculty positions and find themselves in teaching or other administrative jobs, very often not by choice.

Making the long leap from academic research

A microscopic focus on the research topic pursued by the mentor is not conducive to a PhD researcher's broad-based training. While ideally, a PhD should help students understand the philosophy of scientific research and lay bare their passion for pursuing a scientific problem, it is often neglected. The single-minded pursuit of publications by the principal investigators may result in students becoming the much-needed hands required to reach the lab's publication goals. Without skillsets or training needed for jobs outside academia, students find themselves scrambling to discover available avenues

and opportunities as they near the end of their degrees. This is particularly true of those who get disillusioned with the lifestyle and poor pay scales that accompany research in academia.

Despite being highly qualified professionals who spend a considerable part of their lives in research, graduate students are faced with slim pickings and often end up in less suitable (even if more lucrative) non-scientific careers. It was not surprising to learn from a survey conducted by IndiaBioscience as part of the CYC workshops that almost all the participants responded unanimously when questioned about the usefulness of the event and expressed confidence that it would help them navigate their careers. The workshop and webinar series aimed to increase awareness of alternate careers in science, networking, communication, outreach, and honing basic skills in writing cover letters, resumes, and CVs, in addition to showcasing role models who have forged a path in these areas. Anecdotal and personal interactions with students indicated that an overwhelming majority had no exposure to the diversity of science careers available during their PhD program with close to a quarter revealing that the biggest challenge would be deciding the next step in their career after completion of a degree.

Assessing the need for more PhDs

There has been an ongoing debate on whether there are more PhDs than necessary. However, the advances made in biological sciences in the past couple of decades, straddling the intersection of biology and computer science along with the recent pandemic, have demonstrated the power and scope of biology. We certainly need talented scientific minds working on both fundamental and applied science problems but the way forward demands a rethink of our approach. This would involve not just a change in the PhD program structure to ensure that we produce independent and innovative researchers but also necessitates providing them with adequate opportunities for professional growth and financial reward. As part of this exercise, we asked various stakeholders involved in this project to share their recommendations, both short-term and long-term.

Recommendations for the future - Career Development Cells

What clearly emerged from our conversations with multiple stakeholders was the necessity for having a Career Development Cell (CDC) as part of an institute. In the

conversations with PhD students (n=20), nearly half the students voted for the need for an institutional career development cell (CDC) as a top priority.

Career Development Cells or Offices, or Career Services, provides an array of programs and resources to facilitate the career development of students. They often play a crucial role in assisting students in their professional journey. There seems to be a dearth of high-quality CDCs in India, especially catering to Life Sciences students. To some extent, career development is supported by workshops like Crafting Your Career (CYC) by IndiaBioscience in India and training sessions by central funding agencies. On a global platform, there are a growing number offering similar services, and the Cheeky Scientists program is one of them (focusing largely on industry careers). These are often prohibitively expensive for students from India. Many of the CDCs in India are associated with engineering institutes, with the primary goal of placement as opposed to overall career development. CDCs or similar platforms in academic institutes in Europe and the U.S. offer several learnings, which can be leveraged as a starting point, with further modifications as necessary to suit the Indian life sciences ecosystem. Learning can also be taken by studying the post-PhD career trajectories of fields such as Physics, Economics or Engineering where graduates typically embark upon a diverse range of careers following graduation.

The working model of a CDC typically involves components such as conducting career counselling, enabling skill building and networking, facilitating internships, recruitment drives, and campus placements.

These can be discussed under four sections -

1. Career counselling and information dissemination

A critical role played by a CDC is to counsel students, understand their personalities, strengths, goals to provide an overview of different career options. This may need periodic interactions between a student and a counsellor, and CDCs should be staffed with career counsellors with varying expertise. In addition, the CDC could also collate resources related to diverse career avenues and share them with the students on a regular basis.

2. Skill building

CDCs can also play a role in upskilling students through trainings, workshops, and interactive exercises. A few examples of topics that can be covered via workshops and training are written and oral communication, preparing a curriculum vitae/resume and cover letters, filling job applications, interviewing, and in-person and digital networking.

3. Networking

A common refrain was the lack of networking opportunities or a supportive network to leverage, as students prepare for a career post-degree. CDCs can facilitate student networking with diverse professionals. This can be done through the scheduling of frequent talks or interactions with science professionals, and will build awareness on diverse career paths and job opportunities. Guest speakers could also be drawn from the alumni network of the institute or university. The value of a robust network has exemplified by several IITs across India, with students being able to access opportunities through their alumni circle.

4. Job opportunities and placement services

Additionally, the CDC can periodically post job opportunities via the maintenance of job-related databases and newsletters. One of the major roles of the CDCs is to collaborate with employers to organize recruitment drives, job fairs, campus placements, and facilitate internships.

Building a CDC requires careful planning and collaboration among various stakeholders. The office will require a career counsellor, industry liaison officers, and other staff for operational and administrative roles. The team should have a good understanding of the job market and possess strong networking skills while also establishing ties with alumni and professionals from diverse fields. Evaluating the effectiveness of a CDC would be very critical to the functioning and its sustenance and one should be open to do changes as required for overall enhancing the career development journey of a student.

A crucial aspect that would need to be addressed is the funding mechanism to set up and operate a CDC. This could be either an institute-led initiative or a government-funded initiative. Sadly, Indian-based private-sector support for academic biomedical research is minimal at best. Simultaneously an oft repeated gripe is that PhD graduates are not 'industry-ready'. Industry can supplement existing PhD programs/ work together with institutional CDCs to enhance the students' preparedness for an industry career path. This can be done through short term/long terms internships or exchange programs.

Select institutes with active CDCs in India:

1. Career Development and Placement Cell (CDPC) at IISER Pune
Website - <https://www.iiserpune.ac.in/education/career-development-and-placement-cell>
2. Career Development Center at Shiv Nadar University
Website - <https://snu.edu.in/career-development/>
3. Career Development Centre at Ahmedabad University
Website - <https://ahduni.edu.in/academics/schools-centres/office-of-the-dean-of-students/student-services/career-development-centre/>
4. Office of Career Services at IIT Delhi
Website - <https://ocs.iitd.ac.in/ocs/index.php>

Appendix 1: Roadmap for establishing an institutional CDC

Appendix 2: Need for a CDC (via a self-assessment questionnaire for students and organisations)

Appendix 3: Career-related resources from IndiaBioscience

Appendix 1 – Roadmap for establishing an institutional CDC

-12m to -6 m Logistics: Form a committee (faculty + students), allocate funds and space, liaise with an existing CDC for inputs while conceptualising your institutional CDC.

1-3 years: Annual offerings from the CDC should include at least 5 talks by diverse science professionals/recruiters (including industry experts), regular sessions with a career coach, bi-annual workshops/training sessions for PhD students (covering the topics such as the diversity of science careers, finding job opportunities, writing cover letters, building a good cv/resume, mock interviews, effective oral and written communication) and sharing job opportunities. CDC staff should reach out to companies/agencies/organisations that hire life science graduates and build a network of potential recruiters and facilitate placements. A strong alumni network and interactions with students could be facilitated. Conducting annual or bi-annual career fairs (depending upon interest and strength) can be a good addition.

Post year 3: Annual offerings (same as above) + Impact assessment of programs offered in first three years via a survey of alumni, trainers, and other stakeholders. Collection of statistics of alumni placements, increase alumni engagement and incorporate recommendations and suggestions to make the CDC program better.

-6 m to 0 Conceptualisation: Build the annual plan, recruit at least 1-2 dedicated personnel, identify science professionals and trainers for talks and workshops, plan skill building sessions (short periodic sessions or bi-annual one-day workshops), collate resource materials, set up an email id/google form/e-portal for recruiters to submit job opportunities.



Time versus Action map for establishing an institutional CDC

Action steps (m = months)	-12m to -6m	-6m to 0m	0 to 11m	12m to 23m	24m to 35m	36m on- wards
Committee formation, space allocation, concep- tualisation, liaising with existing CDCs in India						
Fund allocation Recruitment of person- nel						
Building annual plans for creating resources and portals, facilitating talks and training sessions, and career coaching						
Annual offerings (talks, coaching, skill-building, alumni interaction, men- torship)						
Planning and facilitating placements and career fair						
Review of the annual plan						
Impact assessment and increase in alumni en- gagement						

Appendix 2 – Self-assessment questionnaire for students and organisations

This section contains short self-assessment questionnaires for students and institutions to assess how prepared the students are to embark on a science career. These can form the starting points of discussions around the setting up of CDCs and/or enable their periodic assessment.

For students

Question	No / Low = 0	Yes / High = 1
1. I feel confident about entering the job market after my PhD		
2. I am well aware about the diversity of careers in the life sciences. (Prompt: can you name at least 5 non-faculty-based career paths)		
3. In the last year, I have attended talks by science professionals outside of a faculty-based research career		
4. I have and continue to receive guidance on pursuing a career in science from individuals or committees apart from my supervisor		
5. I feel that I have the tools to identify a career path i.e. match my skills, interests, and values with the existing job market		
6. I have received training in writing cover letters, resumes, and CV		
7. I have attended mock job interviews		
8. I know how to build a LinkedIn profile		
9. I receive job postings from my institution		
10. My institute has an active placement centre		

Strive for a score of atleast 7/10

For organisations

Question	No / Low = 0	Yes / High = 1
1. Do you have a career development office/centre?		
2. If yes to the above, is this a solely student-run initiative?		
3. Do you have a position dedicated to the career development of students? (Only faculty/students taking responsibility are not counted as yes to this question)		
4. Does your institution have sufficient resources, funds, and office space for a CDC?		
5. Have you had at least 5 diverse science professionals (and not scientists/professors) visit your campus and interact with students in the last year		
6. Do you have an annual agenda for your CDC such as a list of talks, training sessions, exercises, etc. and is this easily accessible to students via a website/ mailing list		
7. Do you provide skill-building training on - writing cover letters, CV and resume preparations, interviews, LinkedIn profiles, etc?		
8. Do recruiters reach out to your institution with job opportunities?		
9. Do you have/collect statistics on career trajectories of students, time to land a job, etc.		
10. Do you track your alumni? Have your alumni embarked on diverse and successful science careers outside of academia?		

Strive for a score of atleast 7/10

Appendix 3 – Career-related useful resources from IndiaBioscience

1. Jobs on the IndiaBioscience website: <https://indiabioscience.org/jobs>
2. IndiaBioscience Jobs and Internships monthly newsletter: <https://indiabioscience.org/meetings/jobs-and-internships-newsletter>
3. Follow us in LinkedIn: <https://www.linkedin.com/company/indiabioscience/>
4. Follow us on Twitter for #ScienceJobsTuesday (@IndiaBioscience)
5. Further readings

- **DISHA (2020):** This e-book provides comprehensive guidance on navigating the landscape of science careers in India. In addition to compiling information about multiple career options open to life science and biotechnology students in India, this book discusses strategies for professional development, job search, and higher education. It also provides an overview of the Indian biotechnology industry and features interviews with leaders in various science professions.

Download here - <https://indiabioscience.org/indiabioreads/disha-a-career-resource-book-for-life-science-and-biotechnology-students>

- **IRIWI: I Realized I Wasn't Interested (2023):** An e-book is a collection of stories around science career transitions, conveyed through the journeys of a diverse set of science professionals in India. These career stories capture their unique journeys, including turning points along their career transitions, or their 'IRIWI' moments.

Download here - <https://indiabioscience.org/indiabioreads/iriwi-i-realized-i-wasnt-interested>

- **Careers in Science (2018):** An e-booklet introducing a range of career options available to students of science in India

Download here - <https://indiabioscience.org/careers-in-science/booklet-on-careers-in-indian-science>

- **Academia-Industry Transitions (2021):** 10 things to know before you make the move - A curation of interviews with established industry professionals from various sectors who have successfully made the transition from academia to industry. This booklet provides science graduates with insights into the basic differences and similarities between academia and industry, and the best way to prepare themselves for an industry career.

Download here – <https://indiabioscience.org/indiabioreads/academia-industry-transitions-10-things-to-know-before-you-make-the-move>

- **Careers in Indian Science (2019):** An e-booklet introducing a whole range of career options available to students of science in India

Download here - <https://indiabioscience.org/indiabioreads/careers-in-indian-science>

Additional Reading

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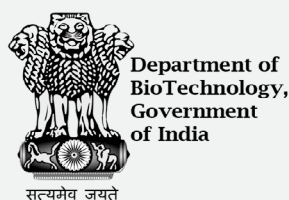
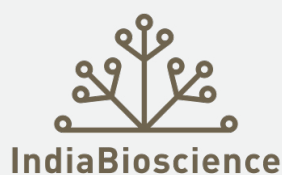
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Acknowledgements

IndiaBioscience thanks all the authors and stakeholders for their contribution towards the creation of this booklet.

Acknowledgements are also due to Manjula Harikrishna, Program Manager - Community Building for her contribution during the making of this booklet.






IndiaBioscience is primarily funded by the Department of Biotechnology (DBT), Government of India.





Contact us:

IndiaBioscience
National Centre for Biological Sciences,
GKVK Campus, Bellary Road,
Bangalore, Karnataka, India 560065

-  hello@indiabioscience.org
-  [@IndiaBioscience](https://twitter.com/IndiaBioscience)
-  <https://www.facebook.com/indiabioscience>
-  <http://www.linkedin.com/company/indiabioscience>
-  <https://instagram.com/indiabioscience>