CAREERS

CAREER LAUNCH Stem-cell dynamo gets his own lab before he hits thirty **p.381**

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Reset your brain

A bit of self-reflection can propel scientists into a career beyond the lab, says **Christopher Taylor**.

Last year, as I later learned, postdoctoral cancer researcher Clayton Boldt was having a bad day. Several weeks' worth of experiments had yielded little in the way of results, his cell cultures were not growing, he had mixed up his samples on a western blot, and he had no spares. As on other tough days, he began an internal pep talk: he was preparing for his future, a research career that would fulfil his love of science.

But as Boldt reviewed what was good about his work, he came to an astonishing realization: he was uncertain whether he actually wanted to pursue academic research. For the first time, he asked himself a question that occurs to almost every biomedical trainee who is considering the next stage of her or his career: 'Where do I go from here?'

In his quest to solve his dilemma, he reached out to me for guidance. As the associate director of the Center for Professional Development & Entrepreneurship at the MD Anderson Cancer Center in Houston, Texas, I have had the opportunity to counsel hundreds of biomedical trainees who, like Boldt, find themselves questioning their commitment to academia. As I do for all in his situation, I advised Boldt to create what I call a career-exploration framework. This process involves four central steps: understand yourself, learn your options, identify any gaps in your knowledge or experience and, finally, launch your plan. Although these steps might look simplistic, each part is important and builds on the previous one.

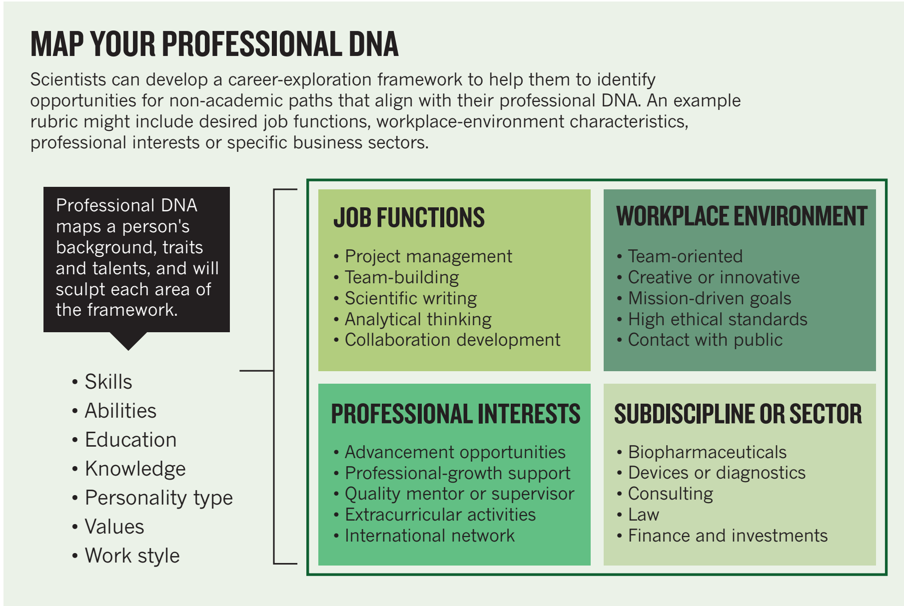
Boldt, for instance, already knew that he enjoyed writing and talking with non-scientists about science. In 2011, he had launched a blog to pose scientific questions and topics to the online community and had begun to develop a reader base that participated in these discussions. This came up as we talked about his career-path challenges and where he saw himself after his training. So, together, we created a framework that helped him to clarify his strengths and improve his candidacy for a communications position that would dovetail with his interest in and passion for science.

Today, Boldt works as a senior communications specialist for MD Anderson. He writes opinion articles, press releases, pitch letters and blogposts in support of the institute's division of cancer prevention and population sciences. "The path out of academic research is not particularly well paved. It is certainly not something we are trained for," he says. "However, when you've found something that excites you, don't be afraid to let it guide you into the unknown."

Boldt is a good example of someone who successfully crossed the bridge from lab research into the non-academic world. Career doubts can paralyse any of the thousands of people who are pursuing PhDs and postdoc training today. By following my four-part plan, scientists can create a career-exploration framework that can help them, too, to realize a non-academic career track.

KNOW YOURSELF

The first step can be difficult — creating a personal framework requires introspection, reflection and taking a frank inventory of your life. Biomedical trainees can view this step as a way to identify their 'professional DNA': personality traits, core values, education, technical training, work experience, soft skills, accomplishments and overall life experience (see 'Map your professional DNA'). ▶



CHRISTOPHER TAYLOR

Researchers can use different methods to sketch out each of these areas. For example, taking the Myers-Briggs Type Indicator personality test (see go.nature.com/rh7koz) can help scientists to determine their preferences, strengths, weaknesses and social compatibility. Another option is to create a checklist that identifies skills that are transferable across different work settings — communication, negotiation and project-management abilities, for instance. Scientists should also make a detailed record of obligations and functions for which they are responsible in the lab.

It is important to articulate these attributes in written form because they help to sculpt the professional DNA map that will become part of the trainee's framework. Without this holistic view, it will be hard for scientists to identify gaps in their skills or experience. This information illuminates the trainee's current candidacy potential while also revealing any preferences for specific job functions, workplace settings and other specifics that they might wish to incorporate into a future position.

I have developed training exercises that aim to guide people towards such self-understanding. One of these, known as '20 words', helps scientists to start to outline their professional and personal identities and flesh out their DNA maps. They ask 8–12 people who are close to them, such as friends, family members, colleagues and supervisors, to choose 20 words to describe them. Such lists highlight positive and negative perceptions that might need to be emphasized or mitigated to potential employers during a job search. Common descriptors also measure how consistent the young scientist is across professional and personal settings. From here, scientists have a baseline from which to explore their career options.

UNDERSTAND YOUR OPTIONS

Opportunities for early-career biomedical researchers to land tenure-track academic positions are shrinking, and US federal funding remains highly competitive. This supply–demand imbalance is well documented (see go.nature.com/aq8qlu). In 2011, for instance, the US National Institutes of Health (NIH) established a workforce committee to investigate the sustainability of biomedical research. Last February, committee co-chair Sally Rockey, deputy director for extramural research at the NIH, gave a lecture at MD Anderson on the situation facing PhD graduates.

Rockey explained that in 2012, some 145,000 biomedical PhD graduates were in full-time positions in the United States, and nearly as many postdocs and graduates were in the pipeline. Although unemployment was at a low for biomedical PhDs, fewer than half of those employed full-time were doing academic research or teaching, and only a small portion had tenure-track positions.

But trainees need not despair: the biomedical enterprise is not limited to academic research alone. Scientists can take advantage of their newly mapped professional DNA to find non-academic career choices that suit them. Although they typically spend years honing their scientific-research skills in a narrow discipline, many of those abilities — such as data analysis and conflict-resolution and presentation skills — are applicable in a broad range of industries and positions outside academia.

Boldt learnt the benefits of transferable skills as he prepared to embark on his new career path. "One of my biggest concerns was whether I had wasted the half decade it took to earn my PhD," he says. "I've realized, though, that my training developed skills I wasn't even aware of — perseverance, project management and communication." He notes that, beyond identifying those abilities, the other challenge for early-career scientists is to find a position in which they can continue to satisfy their love of science.

Career choices are numerous across the biomedical and bioscience enterprise, which consists of at least ten sectors: biopharmaceuticals, devices and diagnostics, consulting, law, finance and investments, government, non-profit organizations, education, health-care, and media and journalism. As scientists narrow their preferences to specific disciplines, they will become better equipped to advance to step three of the framework: addressing any holes in their background.

IDENTIFY GAPS

For this step, biomedical scientists should first research regional, national and international-trade and membership groups and associations, leading companies and the positions that exist in each of their desired sectors. Perusing these networks will allow trainees to gain an understanding of the experiences and skills that will make them competitive for a spot, and thus will flag any potential gaps in those areas that they might need to tackle.

When reading employer expectations, it is important not to focus on job titles, but rather on functions, responsibilities, work environment and aspects beyond degrees or technical skills. Different companies might use variations of titles for a role that carries the same responsibilities, so an online search for 'research scientist' could exclude positions that are equivalent in function, but different in name. Trainees seeking employment will discover that many disciplines are recruiting for similar positions; for example, the biopharma, device and diagnostics and health-care industries may all be looking for a quality-assurance specialist.

Trainees can further pinpoint gaps by examining job postings and by networking — setting up coffee chats, lunches and informational interviews with leaders and executives in a discipline of interest. It is also important to attend relevant meetings in that sector, including conferences and trade-and-industry organization conventions. The trainee's goal is to talk to employers and managers in the business to develop a clear picture of both the minimum and preferred qualifications — and to assess how her or his own skills, knowledge and experience measure up to these requirements.

Armed with this information, scientists can fill in gaps by taking advantage of internships, classroom or online courses at their institution, and Internet communities — LinkedIn, for example — that bring together members of a specific industry or discipline. Once they have solidified their competitiveness in these ways, they can start to write their applications.

LAUNCH THE PLAN

Although a PhD is essential for a scientific discipline, it is also important to recognize that one's degree — or postdoc experience — does not necessarily train one for the work world outside academia. Before launching into the career hunt, graduate students and postdocs should keep timing in mind: those who are more than a year away from the end of their programme should continue to improve their marketability in the industry in which they will seek a job. This could include learning fundamental business principles or earning a certification of value in that sector, such as a Project Management Professional certification in health care.

DAN MILNER

Those who hope to enter the job market in the next year, however, should focus on their job search, including such factors as CV development, professional branding, interview preparation, networking and the job-application process itself.

The CV should spring from the results of the professional DNA map, and needs to highlight transferable skills and specific areas of expertise (see go.nature.com/v1nhnm). Professional branding calls for, at least, a robust LinkedIn profile that mirrors the CV and lists research projects, papers, presentations and peer recommendations. Tweeting publications and talks can also be helpful. To prepare for an interview, trainees should video themselves answering sample interview questions — examples are available at online career forums and publications (see go.nature.com/oiaoik) — and review the footage to understand how a potential interviewer might perceive them.

Trainees should also list 10–15 professionals in their desired industry to contact for informational interviews, and use LinkedIn, company websites and other online resources. It is important to gain insight into how these professionals work and to prepare for interactions with them. Finally, applicants must remember to customize their applications and CVs to address each job advertisement, rather than using a generalized portfolio for all.

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Change is difficult, especially after doing the same thing in the same environment for most of one's adult life. But making the decision to embark on a new direction is often the hardest part. Sometimes taking that different path means believing it is OK to leave academia — even though academic culture may not support that belief. Having the proper tools can reassure biomedical trainees who worry about academia's locked gates — and help them to prepare for and pursue other careers that will offer an abundance of satisfaction and success. ■

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TURNING POINT
Paul Tesar

Paul Tesar discovered a new type of mouse stem cell in 2007 and published his discovery in Nature *as a graduate student at the University of Oxford, UK. The paper launched him rapidly to a professorship at Case Western Reserve University (CWRU) in Cleveland, Ohio, where he continues to drive the field forward.*

How did your graduate experience shape your career pursuits?

I was part of a joint programme — the US National Institutes of Health (NIH) Oxford–Cambridge Scholars Program — and split my time working with NIH human-stem-cell biologist Ron McKay and Oxford mouse embryologist Richard Gardner. I had a great deal of independence from day one. My first publication was a solo-authored paper in the *Proceedings of the National Academies of Science* (P. Tesar *Proc. Natl Acad. Sci. USA* **102,** 8239–8244; 2005) — a feat almost unheard of today.

How crucial was the fellowship to your stem-cell discovery?

I didn't set out to discover another pluripotent state. But my 'eureka' moment came when I derived mouse embryonic stem cells with similar characteristics to human ones, including the ability to differentiate into all other tissue types, known as pluripotency (P. Tesar *et al. Nature* **448,** 196–199; 2007). It took a while to prove that there was more than one pluripotent state, but that paper triggered a frame shift in the field. Epiblast stem cells would have been discovered anyway, but drawing the NIH and Oxford research together put that revelation in our hands. So strongly do I feel that dual mentoring arrangements are fruitful, that I encourage my students to find mentors with different skill sets.

What happened after the epiblast publication?

I was looking for my next position and wanted to maintain my level of independence. I also wanted to go back to Cleveland someday, and the CWRU — where I earned my bachelor's in biology — encouraged me to return. After I explained my goals, they created a one-off position that gave me a few years of funding and my own independent lab straight away. Things went better than I could have hoped. I hired good people and published some strong papers. The next year, at 28 years old, I applied for a faculty position. It was a whirlwind experience.

How did you maintain momentum?

In 2010, I was named a New York Stem Cell Foundation Robertson Investigator, which gave me US$1.5 million in innovation funding. That was enough to grow my lab from 3 to 12 members and to drive our research into unexplored areas. It was such a new field that I was able to rapidly address some major questions.

Is stem-cell biology entering a 'golden age'?

People have expected much from this promising field; it is time to deliver. Stem-cell transplantations are feasible and will continue to advance — and we are learning how to control stem-cell populations to perform specific functions. For example, recently, we screened for drugs that can stimulate the generation of a brain-cell type that is typically lost in diseases such as multiple sclerosis. There has been a huge uptick in the number of stem-cell-based trials, and the results of those will guide the future.

Do you do much work at the bench?

I would love to, but I spend most of my time writing grant proposals and renewals, progress reports and paper reviews. Unfortunately, I am really there only during the holidays after I have sent everyone home. They trust me enough to grow cells.

What is the best career advice that you have given or received?

They are one and the same: maintain work–life balance. The 24–7 culture of always answering e-mail and working through the night is counterproductive. I tell my students that working 12–15 hours a day does not equal a *Nature* paper; being smart about which experiments you pick will get you high-profile publications. When people are happy and stress-free, they can be creative and explore new areas. ■

INTERVIEW BY VIRGINIA GEWIN

This interview has been edited for length and clarity.