How to become a professor?

Being a professor is amazing: a lot of academic freedom to investigate and teach very interesting subjects and a considerable and secure salary until retirement. However, the way in which to obtain this position can be pretty hard and more than 90% of all PhD holders find a job *outside* of academia.

If you want to become a professor how do you qualify?

What qualifications, skills and experiences do I need to become a professor?

You will find below a comprehensive list of the most important parameters which determine the probability whether you will become a professor. All ten parameters play an important role when a professor gets selected by a selection committee.

A warning: These concepts are pretty subjective and derive primarily from experiences in central Europe and may not apply in other parts of the world. These parameters also apply primarily to the life sciences and related domains and may be less important in other fields. However, they may give you a first idea of what to expect when pursuing a career in academia.

Finally, several colleagues mentioned that luck also plays a substantial role.
10 parameters a selection committee will evaluate when selecting a new professor

1. Previous funding

The best predictor for reaching the goal to become a professor is “the ability to raise money”. This may surprise you because everybody will tell you that your publication list is the most important asset. This is wrong. When you successfully raise a lot of grant money it will be easy to pay for a lot of expensive consumables, invest in better instruments and technologies and hire technicians, PhD students and postdocs who will generate a lot of data for you.

Just for the sake of completeness let me add the following caveats:

- There is no guarantee that this money is used efficiently.
- There is no guarantee that a lot of grant money produces great science and high impact factor publications.
- There is no guarantee that raising a lot of grant money will lead to a professorship position.

However, doing research with just a few thousand Euro or Dollars per year will limit your ‘chances to shine’ substantially. Many scientists experience this as the most unpleasant and most stressful part of science.

In the last century, raising industry money (paid by the industry to perform experiments in academia in joint projects or as a paid service) sometimes had a bad reputation in academia but due to the economic development and shrinking budgets of funding institutions, industry money nowadays is seen as a backbone of most big labs.

A selection committee will expect that your previous performance is an excellent predictor of your future performance. Thus, having raised a lot of funding previously makes you a much more attractive candidate because this indicates that you have learned the necessary skills to write successful grant proposals. Therefore, it is irrelevant how much money your supervisor has raised, your name should be on the application form – at least as co-applicant. It is
particularly attractive when you can transfer a nice and prestigious grant from your old to your new institution.

Caveat: Grant money normally cannot compensate for an insufficient publication list.

2. **Your niche**

It is no surprise, nearly all scientists become professors in the field where they worked the last 5 to 10 years and where they have shown expertise and high performance (e.g. high impact factors, patents or industry collaborations). Thus, the probability is high that your current research will determine in which field you become a professor. Defining your niche is therefore extremely important to stay healthy and enjoy your work during the following decades. Most scientists are in their field more or less by coincidence because they have chosen a certain PhD or postdoc project and stayed in this domain since then. **Choosing a niche consciously is therefore a big advantage and may show your leadership skills.** However, avoid a niche which is too small because this may limit your possibilities to get funding. Being an expert in a relevant niche can sometimes even compensate for a limited publication list or limited funding (for example being a highly trained expert in imaging or human anatomy).

3. **First and last author publications**

Apart from grant money and a well-selected niche, the most important parameter to pursue a career in academia is your publication list. In life sciences and related domains **the impact factors of your first and last author publications are still the most important single parameter to judge your “scientific excellence”** (the H-index is not
often used because it does not describe early stage scientists very well and it treats all papers equally i.e., middle author and last author papers contribute equally). There is a lot of debate whether impact factors measure anything useful to define scientific quality and there are multiple suggestions for alternative ranking systems. However, I am afraid there is still a long way to go before impact factors are replaced by better metrics.

In selection committees, impact factors and H-indices can be easily compared between candidates and have a strong impact in most institutions because a lot of intra- and extramural funding is still based on impact factors. To qualify for professorship positions you must develop a conscious publication strategy.

Briefly, a list of 2 or more first author publications with an impact factor above 10 (= “outstanding”) ideally generated in two different labs, dramatically increases your chances to become a professor.

A publication list without publications above an impact factor of 5 doesn’t really stand a chance. Read more here: What is the best publication strategy in science? and How to increase the impact factor of your publications?

Surprisingly, high impact publications (such as Nature and Science) are not absolutely necessary to become a professor. Interestingly, in smaller or less prestigious research institutions a considerable number of professors have no publications with very high impact factors. Thus, there is a limited chance to become a professor without Nature and Science papers. Read more here: Do I need Nature or Science papers for a successful career in science?

4. Teaching

It is not clear whether teaching experiences are an important parameter to become a professor or not. The experiences are mixed. There seems to be a tendency that smaller/regional universities value teaching more in contrast to the bigger and more prestigious universities. Anyway, teaching experience
is a necessity because most professors spend a considerable part of their work time on teaching activities. Candidates without teaching experiences may only be selected for professorships which focus exclusively on research. However, these positions are very rare and attract normally a huge number of scientists with mind-boggling publication lists. Teaching performance is normally difficult to evaluate. The number of hours spent on teaching as well as student evaluations are normally used to get an idea about the qualification of the candidate. Often, a test lecture is requested from the candidates on the short list. Didactical and vocal training is therefore a big plus to survive the test lectures and to give much better lectures later. Teaching can normally not compensate for an insufficient publication list or limited previous funding.

5. **International mobility and exposure to other cultures**

Most research institutions highly value international experiences – and there are good reasons: a scientist who has experienced the culture of other laboratories, different leadership styles and cultural challenges (including feeling lost or experiencing xenophobia) normally develops a much broader view on science and cultural differences and understands better the challenges that young foreigners working in his/her lab face. Working abroad increases your stress resistance, improves your ability to solve problems and to improvise and may broaden your international network. However, there are unpleasant side-effects of international mobility which nobody ever talks about. There are many prestigious universities which explicitly demand international mobility from their young professors and do *not* select candidates without international research experiences. Mobility cannot compensate for an insufficient publication list or limited funding.

6. **Intersectorial mobility and exposure to industry**

Work experience in the industry is mostly considered a big plus in most research institutions. Those candidates have a broader view on decision making processes in
the industry, can communicate better with industry collaborators and may raise industry money more easily. Nowadays, coming back to academia after an industrial postdoc is much less of a problem than 10 years ago – especially when there is still the possibility to produce publications with a considerable impact factor.

7. **International reputation and network**

   This parameter is related to the niche you have chosen. A selection committee will analyze whether you have collaborations with international partners (thus, co-authorships on the same paper, joint grant proposals or joint patents). It is also important if you are embedded in bigger networks in the field such as being a member of big research consortia or having administrative functions such as being the treasurer of a scientific society etc. The number of invited talks or being session chair at scientific meetings are also noteworthy parameters because these invitations are often linked to network activities and are also interpreted as scientific independence (see below).

   An excellent network cannot compensate for an insufficient publication list or limited funding.

8. **Technical skills**

   Technical skills may play a role when an institution seeks to establish a new research domain e.g. to adapt to recent trends. Good examples from the last years are stem cell or optogenetics experts who were tenured to bring this specific expertise to an institution. Becoming an expert in at least one specialized technology or model is crucial but avoid becoming a high-tech technician, e.g. becoming the EM specialist who does EM for everybody and leaving no time for your own research.
9. Vision, leadership and scientific independence

Having a complex and well-elaborated concept about your future research plans is one of the most important elements to convince a selection committee that you are a competent candidate for a professorship position. I have seen many young scientists without any clear idea what to do within the next five years. They are still stuck in a postdoc mindset.

The candidates have to convince the committee that they have a clear idea about their future research line, on how to raise grant money and on how to build and lead a strong research team including some experience in recruiting staff members. Thus, having developed important leadership skills such as team building, recruiting the right people (technicians, PhD students, postdocs) and handling conflicts is a big plus. Real world experiences are more important than just following a few courses on these subjects. Read more here: Do postdocs need leadership skills? and 15 essential skills to lead your research group

You may show scientific independence by publishing independently from your supervisors – especially as first or last author, you should change your lab at least once or twice (PhD not in the university where you did your bachelor and master, postdoc again somewhere else) and publish on a similar or better level in the new lab in order to show that your high performance is not dependent on the supervisor. Invitations as a speaker or chairperson at scientific meetings and being a section editor for a respectable journal, are also useful to show your independence. Independence from your previous supervisors in combination with a strong national and international network will convince the committee that you can ‘do the job’.
10. Participation in academic administration

Participating in academic administration can be a plus but can also be very distracting. Typical examples are being a member in biosafety or ethical committees, selection committees (technicians, PhD students) or reviewer committees for bachelor or master theses. Having these experiences makes it easier to integrate the new professor in the existing academic staff and to delegate unpleasant administrative tasks immediately to the new staff member. However, postdocs can waste a lot of their time on committees without ever seeing a convincing return of investment. It might be worth noting that this can be a particular trap for female academics. Universities are quite keen to show improved gender balance on committees, but with far fewer female academics in total this means that women can get trapped by being put on too many committees. Read more here: Disadvantages of gender policy for the career of female scientists.

Therefore, these activities should be carefully selected to avoid a negative impact on more relevant activities (doing good science, publishing high and raising grant money).

What about being a good scientist?

After reading these parameters, you may wonder whether being a good scientist does not play a role in getting selected as a professor. Unfortunately, the selection of professors is either a completely political event which is only marginally based on qualifications or a heavy administrative process based on *measurable* parameters to guarantee a high degree of transparency. Unfortunately, measuring scientific performance is notoriously difficult. Therefore, proxies of excellence such as impact factors, citations and H indices are used in combination with other (ideally pre-defined) parameters which indicate leadership skills and a broad perspective. Thus, if the selection is highly political it is probably not in your hands. If the selection is transparent and based on qualification, the above mentioned parameters will give you a clear idea what the odds are that you will become tenured.
Only 3 to 5% of all PhD holders become professor – and not all get a permanent contract

Due to the limited budget of universities, the number of professor positions have not substantially increased although the number of PhD students is continuously rising. This makes sense in a knowledge economy where highly trained knowledge workers are needed in multiple different domains of society. It also means that only 3 to 5% of all PhD holders and about 10% of all postdocs succeed in becoming a professor. Read more here: Should I become a professor? Success rate 3%!

Another important point is that many research institutions now tend to limit academic contracts, often 5 year contracts followed by an evaluation. In other words, when you fail, you may be a middle-aged jobless academic. This reduces the attractiveness of an academic position because you may commit yourself to a ‘life-long life style of a workaholic’ (Adrian Liston). However, this is probably true for most careers you follow with ambition. On the other hand, being a professor can be amazing: a lot of academic freedom to teach and investigate very interesting subjects of your choice and a considerable and secure salary until retirement.

**Thus, the final advice is: When you decide to become a professor, you must love science a lot to persevere!**

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