



HOW TO BECOME AN EXPERT IN YOUR SCIENTIFIC FIELD

By Sven Hendrix



The following article is a short excerpt from my upcoming book, "Expert secrets for scientists," which will be published soon.

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Why become an expert in a complex world?

The world desperately needs experts. We live in a complex world, and knowledge is dramatically expanding. Nobody can comprehend anymore all the data which are produced on a daily basis. The division of labor is vital to data collection, data analytics, and critical thinking. Highly competent and specialized experts are needed to interpret significant findings in the context of the questions addressed and the methods used. Thus, experts are required to generate knowledge to improve the human condition.

From a **societal perspective**, experts are needed to generate expert knowledge in a defined field (such as molecular biology, economics, architecture, or art). So far, artificial intelligence systems can not do that and often come to misleading conclusions. Experts are necessary to embed this specialist knowledge in the public consciousness.



From a **personal career perspective**, becoming an expert is crucial for your professional training. It is essential to [develop scientific independence](#). You become competent and visible in your selected field, form networks, get funding, publish exciting data in high-quality journals or books, and generate excellent research. Experts are in high demand. At the beginning of a scientific career, becoming a generalist may damage your career. However, with increasing seniority, the

best scientists tend to become generalists and provide broad perspectives beyond their fields' specificities. You become a thought leader. Anyway, becoming a specialized expert is critical for researchers at an earlier stage of their careers.

Career or contribution?



Many young scientists struggle with the dilemma of whether they should focus on either pure science and contribution to humankind or selfishly develop their careers. When focusing exclusively on pure science and contribution, you will be outperformed by the career guys. **Concentrating too much on pure science and contribution leads to frustration and cynicism** because everybody gets promoted while you do not. This is bad for your self-worth as well as your bank account.

On the other hand, **focusing too much on political strategies also leads to frustration and cynicism** because everything becomes a strategic game. This is bad for joy and pleasure and bad for long-term fulfillment and a meaningful life.

Your love for the scientific method and taking care of your career do not exclude each other. Read more about the [dilemma between career and contribution](#).

Thus, there are three simple rules to combine pure science and strategic career development:

1. Learn how to pursue a successful career in science to care sufficiently for yourself and your family.

2. Become exceedingly good at something to gain freedom—become an expert.
3. To create a fulfilling career, remind yourself weekly *why* you are doing science. What will you contribute, and what is the value you want to create?

These are essential building blocks for a fulfilling career. However, you will not always be bedded on roses.

Become excellent - don't be a fraud!

You may roll your eyes when reading that. I understand. However, I want to make this point very strong: only knowing the literature and your methods and doing great marketing is insufficient. As a rule of thumb, two thirds of your performance should be creating data. If two thirds are marketing or networking, your reputation will suffer long-term. Your colleagues will realize quickly whether you are excellent in your field or just a talker. Your expertise in designing outstanding research projects and programs, the quality of your data and publication list, and the amount of grant money you have raised clearly show your work's quality. Thus, you will be accepted only as a real expert after many years of experience "in the trenches." To promote your progress in science, it makes sense to [strategically increase the impact factors of your publications](#) and [to raise more funding](#).



Challenges while becoming an expert in your scientific field

There are several challenges when becoming an expert, such as the pain of choosing the right area, a huge workload, a narrow view, and the potential shame of being in the "ivory tower." In addition, there are opportunity costs: If you focus your energy and time on one theme, you do not have time and energy for other interesting subjects.

Limiting yourself to only one area of expertise

You will suffer most when you have to pick *one, just one* area in which you want to become the go-to expert. This feels terribly restrictive and limiting. It seems to end curiosity. It seems to end the fun of learning and playfully gaining knowledge. But it does not have to be this way.

Unfortunately, the infrastructure of the knowledge-generating institutions, such as universities and research institutes, is built in a way that promotes fragmentation. An important reason is the fractured distribution of grants (funding for research personnel, consumables, and infrastructure, especially in the technical and natural sciences). This system incentivizes young scientists to excel, become visible, and compete for attractive grants and positions.

As a consequence, personal competition may inhibit collaboration in many contexts. Again, this may feel like the wrong way to work in science, but it does not have to be this way. Individual differences in expertise may be helpful because such complementarity may lead to superior performance.

Experts with complementary expertise often form small and huge networks to raise grant money and join forces to address particularly challenging research questions.

For example, entry-level data scientists may work with neuroscientists or immunologists and apply for a consortium grant a few years later.

Research assistant positions in different fields and laboratory settings offer opportunities to gain practical experience and develop valuable professional skills in the data science field, software engineering, and other related areas. Expert performance in data analysis, statistical modeling, and predictive models is necessary to excel in many fields, from atmospheric science to public health.

Political attacks

Another disadvantage of becoming an expert is exposing yourself to political enemies. It has become a widely used political strategy to discredit specific scientists, groups of scientists, or science in general. Typical examples were the personal attacks on climate change or COVID-19 researchers and institutions. No matter your opinion on these research subjects, it is evident from the recent past that many unfair methods have been used to discredit entire branches of environmental science and immunology as well as specific experts. You may become a political target if you are an expert in a controversial field. Therefore, it is crucial to be aware of the potential political implications of your expertise and to make a conscious choice about whether you want to be visible to the general public or only to the scientific community.

Is it worth it? Yes!

Becoming an expert costs time and energy and demands substantial discipline. Time and energy invested in one field cannot be invested in other interests. You may wonder whether it is really worth the effort. The clear answer is: *yes*.

The two main arguments are:

1. If you want to find your passion and your mission, become an expert.
2. If you wish to pursue a successful career in science, there is no way around becoming an expert.

However, the keyword in the second statement is "successful". Your personal [definition of success in science](#) may differ from mine. My view is formed by studying medicine,

working as a physician, master skills in biomedical sciences, becoming a professor, and educating thousands of young scientists. Thus, my perspective is biased and limited, as is everybody's. Therefore, the rules and principles may be different in other fields. However, until now, I have not found an area where generalists are valued more than experts—from a career perspective.

Finally, reflect for a second on your idea of success in science. A definition of "success in science" may comprise many, many aspects and very specific goals ranging from personal fulfillment, the urge for knowledge, deliberate practice, mastering skills, personal excellence or fame, and being of service to society or humanity. The list of motivations is endless. See here a short article about [potential indicators of success in science](#).

How many hours to be an expert in your area of expertise?

How many hours to become an expert

You may wonder, how long does it take to become an expert in science? You may have heard of the 10,000-Hour Rule.

The 10,000 Hour Rule is a concept popularized by author Malcolm Gladwell in his book "[Outliers: The Story of Success](#)" (affiliate link). The rule states that it takes approximately 10,000 hours of *deliberate practice* to achieve mastery in a new field.

What is "deliberate practice"?

"Deliberate practice" is a term coined by psychologist Anders Ericsson and popularized by Gladwell in his book. The concept refers to a type of practice and feedback specifically designed to improve performance focused on pushing individuals beyond their current abilities to achieve high levels of skill and mastery.

Deliberate practice involves breaking down a skill into its component parts, working on each element individually, and receiving positive or negative feedback from a teacher or mentor to help identify areas for improvement and get best practice tips. Becoming world class requires focus, repetition, persistence, and the ability to identify and correct mistakes via feedback. It is essential to look at different angles and develop new ways of thinking about problems.

The best mentor gives you specific feedback to master specific skills on a regular basis to achieve specific goals. That's why you need **10,000 hours of practice**.

Deliberate practice differs from simply playing or working at something, requiring conscious effort and the intentional choice to improve. Hard work is not enough to improve your performance. If you repeat the same mistakes over and over, you get the same results.

Gladwell argues that this amount of time, focused effort, and feedback can lead to exceptional performance in various domains, from sports to music to entrepreneurship. **Thus, it is safe to assume that it also takes about 10,000 hours to become an expert in research and development.** To better understand the concept of deliberate practice, I would suggest Malcolm Gladwell's book "[Outliers: The Story of Success](#)" (affiliate link).

How to start? Have a plan!

Becoming an expert may feel overwhelming. **If it does not feel overwhelming, your ambitions may not be big enough.** Developing a learning plan with small steps and milestones is the best way to handle feeling overwhelmed.

Three steps to becoming an expert

There are three key steps to becoming an expert.

1. The first step is **defining your area of expertise** (your niche).

2. Secondly, you have **to become extraordinarily knowledgeable** in your field.
3. Thirdly, you have to **become recognized as an expert** in your field and beyond.

What should I become an expert in?

Your future area of true expertise is your "niche": a job or activity which is very suitable for your talents and skills - and you are genuinely interested in the topic. Your niche is not necessarily set in stone. You may change your field after a short period or develop slowly into a different area after many years. Or you may stay an expert in your field for the rest of your life. However, for pragmatic reasons, choose a niche now, expecting to change it during the next two years.

Why should I define my niche?

Most researchers are in their field more or less by coincidence because they have chosen a specific PhD or postdoc position (for example, in neuroscience, data science, or computer science) and have stayed in this domain since then. Continuing what you have done for your master's degree or graduate school and not changing the subject area may not be the wisest strategy.

Consciously choosing a subject and a niche is a critical advantage from a career development perspective. It shows your leadership skills and makes you more attractive to employers. In addition, you may consciously align your choice with your highest values and interests. This breeds passion for your field and reduces the overwhelm dramatically.

How to consciously choose a niche?

Choose a niche related to your current work or activities for pragmatic reasons. Let me use an example from my own field of expertise. Let's say you are currently completing a PhD, postdoc, or tenure track in natural science. You probably have 1–3 major projects, ideally in a

related field. Let's take neuroregeneration as an example. In this field, you may be specialized in a specific disease (e. g. spinal cord injury) and/or a particular cell type (e. g. macrophages) and/or a specific group of molecules (e. g. proteases) and/or a specific set of methods (e. g. optogenetics).

Each field or each overlap of fields can be your future area of expertise. You can become an expert for spinal cord injury, macrophage biology, protease biochemistry, optogenetics, or data science. You may also focus on overlaps such as macrophages in spinal cord injury, protease biochemistry in macrophage biology, or optogenetics in spinal cord injury. The possibilities are endless. Thus, young scientists can become top of their field as immunologists, biochemists, or data analysts – starting from the same thesis or postdoc project.

To be an expert in something, you must choose an area of expertise you want to work in. It is neither necessary nor realistic to become an expert in multiple fields — at least not at the beginning of your career.

Become extraordinarily knowledgeable in your field!

If you want to know **how** to become an expert in your field, you need to know **what** makes you an expert. Gaining a solid foundation in a relevant bachelor's degree, master's degree, and PhD is a good start. However, being diligent is not sufficient. You need a better strategy:

Briefly, you need to know the most important literature, the essential methods, and the key persons. Thus, invest your 10,000 hours wisely.

Identify and memorize the most relevant information

Becoming knowledgeable costs time but can be very satisfying. In the beginning, you have to find orientation quickly. Which information is relevant? **The easiest way to start is to find the 10 milestone publications in your area of interest.** These can be journal publications,

books, or other formats, depending on the field. No surprise, there are big differences between medical psychology, cardiology or data science.

Identifying the top 100 milestone papers in your field

To start, create a "Top 100 list," e. g., in Microsoft Excel or Word. You will systematically collect information about each paper, such as the complete reference (all authors, title, journal, year, pages; for books city and publisher), where you have found this paper, and the reasons why this paper may be relevant for you. If you routinely practice and master the ability to collect this data, your writing will improve.

Start with your favorite search engine

The fastest way is to use your favorite search engine and type in "100 most important scientific papers" along with your area of expertise or specific keywords. This will produce a long list of lists with essential papers.

An article's "importance" is often based on the number of citations. For now, this is a helpful proxy for significance. If many people cite a paper, it has a lot of impact on the field. You will also find lists based *on personal preference*. Great. All types of lists are useful because they apply different selection and ranking criteria. Identifying these criteria is already very helpful to understand better which parameters may be used to determine the scientific quality and excellence in your scientific field. Ask experienced colleagues for feedback on your selection of articles.

Suppose you are a beginner in the field. In that case, a simple specialized textbook may be a great resource to get a broad view of the domain and find key references. It is evident that Amazon is a great search engine for books. If you're lucky, you will find one or more books from the last two years.

The advantage of textbooks is that the entire field is presented in a structured way with key

references that can go on your top 100 list. Before you buy a book, check first whether you can find it in Google Books for free.

Create your Essential Reading List to become an expert

To be efficient, it is useful to find the top 10 and top 20 papers on your list—these are the marked papers that are relevant, repeatedly appear, and have the highest number of citations. This is your Essential Reading List. Rank the list and start with the articles about the most interesting subject to boost your motivation to read! After you have worked through them, you have developed a routine and got momentum to read more. The ranking is preliminary. You may later shuffle the order because your interests may change with increasing knowledge and practice. Now you are very well prepared to start your personal education and [develop the best publication strategy](#) for your career in science.

Develop a reading habit to become an expert

In principle, you can spend your entire life learning and memorizing knowledge. However, for most people, becoming an expert is a means to an end. Your career goals may include the following:

- » developing a successful career in science
- » building a pleasurable network of friends and colleagues who share similar interests
- » solving exciting riddles of nature
- » improving the *conditio humana*

How to become an expert in something? You have to devote time, get enough sleep and avoid getting overwhelmed. The first step is to reserve one hour per week (maybe the last work hour on Monday) to sort out, organize, and prioritize new information and data. Gain experience in acquiring these new skills by deliberate training. Test different systems to screen the most important sources of new

knowledge. **The key is consistency.** Therefore, more than one hour is often unrealistic for an active researcher. The time studying must be limited.

Thus, reserve only one hour per week to sort out, organize, and prioritize your reading material. If you book more time, you will probably cancel it often and break the habit.

If you are a slow reader, you may start to practice speed reading. Let me suggest the following inexpensive book to increase your reading speed: "[Speed Reading: Learn to Read a 200+ Page Book in 1 Hour](#)" (affiliate link) by Kam Knight.

Which techniques and methods should I learn to gain expertise?

To become an expert, you should master 1–3 expert methods. What does this mean? You know expert methods by heart. You did not only follow online courses. You have enough practice to explain it easily to any new staff member, and you can troubleshoot immediately. You may think, "Sounds great, but how do I know which methods to choose to become an expert?"

Not all skills are useful!

There is a simple rule that may help you to make your decision:

Learn valuable techniques and methods that are not too crazy-specialized and not too standard. Finding a job or publishing may be challenging if your expertise is too specialized (for example, data visualization techniques for cockroach researchers). The same is true if you have only expertise in common techniques. Many people have sufficient knowledge of traditional techniques such as qPCR (quantitative Polymerase Chain Reaction), Western blotting, immunohistochemistry, etc. This is basic knowledge. Becoming an expert in these methods is only a good idea when your long-term goals include working as a specialized staff member or technician. Excellent technicians always find work, but average

salary, societal status, and further professional development may be limited. Becoming an expert in traditional methods is probably not advised when you want to become a principal investigator. Thus, reflect and decide whether you aspire to become a high-tech technician, a specialized staff member, or a principal investigator to determine your strategy.

I would not suggest being primarily guided by job opportunities. For example, well-intentioned advisors may insist that you must focus on getting advanced degrees in big data management. Machine learning and studying a programming language are essential because data engineers will be paid highly to handle large amounts of data in biotech. However, your life will be miserable if you hate doing this work. Instead, focus on subjects and powerful tools you find extremely interesting and become excellent at them. This is a great way to reach a fulfilling and well-paid career.

But the rule of thumb is simple for all three options:

1. **Learn 1–3 techniques REALLY well.**
2. **Know a handful of techniques good enough to judge others' work in publications and give feedback when working with others. Become well-informed.**
3. **Ignore the other techniques until you need them for a specific project.**

Become recognized as an expert in your field and beyond

Becoming visible as an expert in your field

From a professional perspective, becoming visible as an expert is crucial to becoming part of expert networks and committees, getting funding, and getting published in high-quality journals. Below I will describe many strategies to increase your visibility. Focus only on one or two at a time and ensure they are appropriate for your career stage. Founding a scientific journal or a scientific society is probably not the best

first step for a PhD student. At the beginning of your career path, it is a healthy strategy to focus on generating an excellent publication list (consistent, high impact factors), raising grant money, and building a broad international network. In later career stages, becoming an editor of a key journal or board member of a scientific society may be more appropriate.

Publish strategically and consistently

The first step is to publish with a clear strategy in mind. Your publications should be mostly, if not always, in your selected niche. Select strategically the academic journals in which you publish. Some journals may have a lower impact factor than others but are widely read in the field. Discuss which journals have the broadest audience in your particular area of expertise with your colleagues. To publish more papers, it may help [to learn how to write faster](#) and how to get higher impact factors.

Present your data strategically and consistently

Like your papers, your posters and talks should be mostly, if not always, in your selected niche. Select strategically the meetings and conferences where you present your data. You may be forced out of your comfort zone if you are not used to being a public speaker. You should spend a considerable amount of time practicing being a public speaker on an expert level.

Smaller meetings with a specific scope may have the advantage that a very selected and specialized audience will be exposed to your findings. The number of persons may be lower, but the density of key players in your field may be much higher. On the other hand, big meetings may attract more research scientists from adjacent fields who may be interested in your research and ask interesting questions. They may also consider collaborating with you.

I wrote another article with suggestions on [choosing the right scientific meetings to attend](#).

Networking to become an expert in science

To get established as an expert in your field, you have to become proficient in networking. Surprisingly, soft skills play a major role in academic and corporate research, as effective communication and collaboration with other researchers, medical experts or private companies is often needed. Learning the necessary skills can be part of formal training programs. However, a private endeavour can help speed up the learning curve substantially.

Science and research are social processes. You write your papers for editors, reviewers, and finally, readers. You write your grant proposals for expert reviewers. You promote your research on social media. You get invited as a speaker by your colleagues. You organize scientific meetings together with your colleagues. You apply for new positions and get evaluated by selection committee members who may become your new colleagues. During your career, you hire promising new group members, build multiple teams, and help your staff members to develop themselves and their careers. You do joint research projects with your colleagues, write collaborative grant proposals, have joint PhD students, and publish joint papers with other experts.

Gaining work experience as a research fellow at a top institution or medical school can provide access to massive amounts of data and opportunities to contribute to high-value research. However, without connections and visibility, your career will be stuck. Thus, developing and practicing social skills is invaluable to becoming an expert and doing great science.

Networking is a crucial skill to practice regularly. The average person hates it, and many people try to avoid it. Some even claim that scientists are more likely to be on the autism spectrum than the normal population and may be more challenged to become proficient in social skills. The main point is that learning simple strategies and leaving your comfort zone to improve your

current skill level in networking will promote your scientific independence.

It is a little bit like developing a personal brand not only through contributions to academic research. You will also be visible via media outlets and social media to establish credibility and expertise in your particular field.

If you are convinced now that you should learn networking skills, I suggest following a seminar or reading a few books about networking. On course platforms such as Udemy, you will find helpful courses on networking. If you are patient and wait for promotions, you may spend just \$10–15 for an online course. Similarly, there are many books on networking. For example: "[Taking the Work Out of Networking: An Introvert's Guide to Making Connections That Count](#)" (affiliate link) by Karen Wickre.

The following articles may also interest you:

[How To Write Faster: 19 Efficient Ways To Finish My Publication](#)

[Should I Become A Professor? Success Rate 3 %!](#)

[Am I good enough for a career in science?](#)

[Do I really have to go to a famous university for a successful career in science?](#)

[Am I doing enough for my scientific career?](#)

[Scientific independence – how to develop and demonstrate it?](#)

[How to become a professor?](#)

[10 simple strategies to increase the impact factor of your publication](#)

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