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Standing on the Shoulders of Giants – Your Mentors and Role Models Will Shape Your Career

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Abstract: Choosing the right mentors and role models has a profound impact in both our lives and professional careers; however, most often, not enough time or thought is given to this important decision. Because of that, we may miss some great opportunities and limit the potential benefits. In this invited contribution, I share my personal experience on nurturing the relationship with mentors and on choosing role models with my same values and a strong sense of service.

Introduction

We all have to make difficult decisions. Sometimes, it's about our professional career, such as a new job opportunity, sometimes is personal, but quite often is both. The decisions we make affect our professional development, the people around us, and the type of person we are. That is why it is so important to have good role models, that is, people we admire and whose lives serve us as a moral compass. But also, mentors, people who because of their experience and personal qualities, help us make better decisions, or at least more conscious ones. A good example of that are the people who *Nature* recognizes every year with the Award for Mentoring in Science and whose lives, personal qualities, and to some extent, their professional achievements, are good examples of the qualities that a good mentor should have.[1] Choosing good role models and mentors has a very important impact on our lives; however, quite often, we do not give enough time or thought to it or, even worse, we use some spurious criteria. For example, I strongly believe that we shouldn't chose our mentors based on the number and impact of their publications.[2] Herein, I present some tips and tools on how to choose those role models and mentors who best fit our values and can inspire us to grow both personally and professionally.

An important point that we usually forget is that our actions influence other people – certainly our children, but also students and work colleagues. That is why it is so important to be aware of our behavior and to remember that with our actions we can inspire, empower, and help others to become better people and better professionals. As our mentors and role models help us, we can also help others to grow.

Choosing the right role models: a moral compass and a source of inspiration

Choosing our role models is one of the most important decisions of our lives. This is not an easy task. To help you identify those people who can help you grow both as a person and as a professional, you may use the following opportunities:

1. Read biographies to discover new and interesting people and who they made difficult decision and the resources they used.
2. Learn more about the lives of great people who made significant contributions to your field. Most likely they had to face similar challenges to the ones we will have to overcome.
3. Realize that every person has their lights and shadows. A role model is not by any means a perfect individual. It is a person who exemplifies some of the values we want to live for and made some difficult decisions that can serve you as an inspiration when you have to face similar challenges.
4. Identify the values that are more important to you and find the people who has lived according to those principles.
5. Ask yourself what your role model would have done in a particular situation, and if that answer helps you to make a difficult decision and to become a better person and advance in your career, that role model is probably right for you.

Figure 1 includes some tips that will help you identifying potential role models. However, finding role models from minorities and underrepresented communities may be a challenge. That is why editors, educators, group leaders, and in general, all of us, should make every effort to recognize and give visibility to those who may have a more difficult time and whose contributions may go unnoticed.

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Figure 1. Some tips on how to find the right role model for you.

Figure 2. The qualities of a good mentor. Use this list when looking for a mentor who fits your needs, personality, and values.

What are the qualities of a good mentor?

A mentor is not a person who will answer all your questions, but rather a colleague who will help you find your own response by asking the right questions. Also, a mentor is not there to do you favors, but to help you to reach your full potential. Listed below are some qualities that you should be looking for when identifying the right mentor for you (Figure 2).

1. A mentor should be an experienced professional, from whom you can learn and get useful advice.
2. A good mentor should be respectful, yet willing to challenge you to reach your full potential.
3. Generosity is probably the quality that better defines a mentor because they offer their time, knowledge, and contacts to help you out without expecting anything in return.
4. Mentors are, in most cases, busy professionals; so make sure to choose a committed one who will be willing to devote enough quality time to you.
5. Two important qualities of a mentor are sympathy and active listening. They should learn how to ask the right questions, to build on your answer, and to provide constructive feedback, even criticism.
6. Like in any other relationship, it is important to have good chemistry. You both should give yourself some time to learn if that relationship works out.
7. Choose a mentor who shares your values. This is very important to get advice aligned to the kind of person and professional you want to become.

Of course, the mentor-mentee relationship takes work from both sides. You must also invest the time and commitment required to make the most of this association. In fact, the more you put in building an honest and valuable relationship, the more you will get out of it. Be ready to answer tough questions and to listen challenging remarks. Good mentors are not there to tell you what you want to listen, but to ask you the right questions. And remember, there is no such a thing as the right role model and there is no person from whom we cannot learn something.

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Who are my role models and how and why did I chose them?

I decided to become a chemist before I knew what chemistry was. Since I was very young, I always enjoyed making experiments, loud explosions, and colorful fires; things that today are out of limits for kids. Like many children of my generation, I played in the streets of my town. There, I developed my early passion for chemistry, which at that time was just one more game to play. I was still very young when I built a small

laboratory in my parents' house with the materials and chemicals that I could get from a nearby drugstore. It was there that I began to do my first chemical experiments. I quickly realized that if I wanted to do more and better experiments, I had to read and study more. My high school chemistry teacher, Dr. Sergio Menargues, had a profound impact on my decision to become a chemist. He quickly noticed my endless curiosity and passion for science. Today, he is a good friend with whom I meet frequently. But why I chose him to be, not just a friend, but a mentor? First and foremost, because of his values: rigor, hard work, and passion for chemistry. He has been a constant source of inspiration to me. He always makes himself available when I need him and listen carefully before asking that key question that helps me frame the problem. A few questions later, and I have already answered myself.

It was during my college years when I really understood what chemistry is all about and when I first heard about the people who today are my chemistry heroes. I would like to mention just two of these to explain how and why I chose them. They are Ernst Cohen and Enrique Moles (Figure 3). They are neither the most well-known chemists, nor those who have made the most important discoveries, but their examples have always encouraged me to put my passion for chemistry at the service of others. Their commitment and tireless efforts to build a peaceful world through science have been a constant source of inspiration.

Ernst Cohen was the third president of IUPAC, a Dutch physical chemist who worked all his life to bring together the chemists from the nations that fought in World War I.[3] Thanks to his many efforts, German chemists, led by Fritz Haber, joined IUPAC in 1930. In 1942, like many other Jews, he was stripped of all his possessions and forced to wear a yellow Star of David. Sadly, and despite the efforts of many great scientists of his time who wrote letters highlighting Cohen's contributions to chemistry and his efforts to bring peace through scientific collaboration, he was killed in a gas chamber in Auschwitz in March 1944.

Enrique Moles is the father of modern chemistry in my country.[4] He was the organizer of the first major scientific congress that Spain hosted, the IX IUPAC World Congress of Chemistry, in Madrid during the Spring of 1934. That same year he was appointed vice-president of IUPAC. Enrique Moles greatly contributed to improve science education and research in Spain and his efforts led to important advances and produced some of the best chemists of a new generation of Spanish scientists. Unfortunately, and like many other intellectuals, he had to go into exile from Spain during our civil war and was later imprisoned and retaliated during the dictatorship of General Francisco Franco. The example and commitment of both Cohen and Moles, who worked tirelessly during very difficult times to build a better world through science, are an inspiration to all of us.

Figure 3. Ernst Julius Cohen (7th of March 1869, Amsterdam – 6th of March 1944, Auschwitz) (left) and Enrique Moles Ormella (26th of August 1883, Barcelona – 30th of March, 1953, Madrid) (right).

Both Cohen and Moles had leadership roles at IUPAC and played a key role in shaping this organization. They are a constant source of inspiration for me as IUPAC enters in its second century of history. In the last months, I found myself wondering what they would have done. The answers I got reflecting on how they led this organization under much more difficult circumstances have been extremely useful. Role models are quite different from mentors. Typically, they are not that available and don't know you. However, having good role models is a great way to tune your moral compass and to stay true to your values.

The new chemist: a professional with multiple working and serving experiences

A few years ago, I wrote an Editorial for *Chemical and Engineering News* entitled the New Chemist, in which I commented on how rapidly the profession is evolving yet how slowly chemistry education is adapting to these changes.[5] The chemist of the future will not only need to know new techniques and concepts, but also to develop new skills. As our teams are more diverse, change is the new normal, and chemistry is becoming increasingly important in building a more sustainable future.[6] The new chemist is likely to have not only different jobs, but to follow different career path. In an article I wrote for *Science Careers*, I explained why having founded and led my own company to commercialize my discoveries had made me a better researcher and educator.[7] Similarly, volunteering in an international scientific organization you will develop new skills, learn how to work in diverse environments, and expand your career opportunities. I am convinced that pursuing what some may consider an unconventional professional path is one of the best ways to enhance our personal and professional experience, develop new skills, and, all in all, live a richer and more fulfilling life. Yes, focus is important, and many will advise you to serve once you have secured your future in academia, but serving in an international organization is a very enriching experience that can bring you new opportunities that otherwise, you will miss if you "just stay focused". By volunteering in an international scientific organization, you will develop countless new soft skills, especially active listening, leadership, and teamwork; but also, your vision becomes broader, more diverse, and inclusive. But joining a

large international scientific organization may not be easy or just not possible for everybody. Serving in a smaller organization or volunteering in a local NGO (non-governmental organization) will provide you with plenty of opportunities for personal growth, for creating new connections, and developing new skills.

In my experience as founder of Rive Technology, if you decide to build your own company will develop countless new skills; however, the experience of volunteering in a big international organization is a unique learning experience where you grow professionally and personally, while carrying out a commendable activity that will make you feel fulfilled. During my years of service at IUPAC, and specially in my new responsibility, I have learned some lessons that can be very useful to other people who are considering serving in an international scientific organization. These are some of these lessons:

1. This experience gives you the opportunity to work in a very diverse environment where cultural differences, priorities, and even world views are as varied as it gets.
2. In such a complex environment, you will develop many soft skills including empathy and open-mindedness; but, at the same time, you will have to learn how to keep your priorities and advance your own program.
3. You will learn how to teamwork, delegate, and, above all, to rely on like-minded people to carry out the projects that are most important to you.
4. You will discover international programs and career opportunities that otherwise tend to go unnoticed.
5. You will come into contact with many people working in a number of global organizations who may become great professional contacts in the future.
6. You will have the opportunity to shape your field and make a difference in the world by working on those projects or initiatives that are more aligned with your passion.
7. Serving in an international scientific organization is a fantastic way to make friends from around the world who share your same interests.

The experience one can gain by volunteering with an international organization is invaluable. You will grow both professionally and personally while you will enjoy working with other people who share your drive to build a better world, as summarized in Figure 4.

Figure 4. Some benefits of volunteering in a global scientific organization.

At IUPAC, we provide many opportunities for mentoring. The Young Observer program is a great way to know and get involved in IUPAC activities. Also, many early-career scientists who contribute and, in some cases, lead important IUPAC activities, are member of the International Younger Chemist Network (IYNC), an associate organization of IUPAC.[8] Through these groups, we aim at creating the opportunities for mentoring and even for working with people you admire in projects that contribute to advancing chemistry worldwide. In fact, IYCN aims "not only to develop network of early-career chemists but also a lasting system to foster growth and mentorship in chemistry". To achieve this goal, IUPAC and IYCN have partnered to create *ChemVoices*, an online platform to provide early-career chemists with a platform to discuss matters that were pertinent to not only their careers but also the scientific community as a whole.[9]

Another IUPAC program that aims at creating opportunities for mentorship is the Global Women's Breakfast, a worldwide initiative that, coinciding with the United Nations Day of Women and Girls in Science, gathers people for an informal breakfast where everybody is welcome to share experiences, ideas, and proposals with the aim of promoting diversity in science through networking, mentorship, and leadership.[10] This initiative also aims at creating cross-mentoring opportunities, in which both women and men can find mentors from different genders, backgrounds, and experiences.

We must be aware and always remember that our actions (even inadvertently) have a great impact on others. This is especially true for the ones of us who teach, supervise students, and work with early-career scientists. Our actions should follow our values because we educate more by example than by talking. This doesn't mean that we should aim at becoming mentors of all our students and younger colleagues; however, we should aim at inspiring, empowering, and making everybody feel included.

Serving at IUPAC has been one of the best decisions of my life and I must thank my mentors who have always encouraged me to be generous and to volunteer. Chemists whose scientific achievements may not be the best known, but whose lives exemplify service and commitment. Their courage during troubling times inspired us to take on new risks, their commitment guides us when we have to make difficult decisions, and even their mistakes, failures, and weaknesses stimulate us when things are not going well. Who are your role models? What are their values? What are you doing to follow their footsteps? Isaac Newton once said: "I saw further because I had stood on the shoulders of giants" – make sure the shoulders you ride on are good ones.

Disclaimer

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Conflict of Interest

The author declares no conflict of interest.

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