

**W**e talked to **Prof. Elżbieta Frąckowiak**, Vice President of the Polish Academy of Sciences, about relative sizes of “fishes” and “ponds” and the height of glass ceilings in the research world.

# A GUIDE

**ACADEMIA: You have won a distinction that makes a huge impression in Poland: the Prize of the Foundation for Polish Science, informally dubbed the “Polish Nobel”...**

**PROF. ELŻBIETA FRĄCKOWIAK:** It really shouldn't be called that, as it overstates the scale. A scholar who wins the real Nobel Prize is a shark. I am just a small fish. When one looks at how science gets done abroad, it is visible that we Poles are still lagging quite far behind.

## Why?

Perhaps we are unable to evaluate ourselves critically? Some of us feel like truly big fish in our little Polish pond. My husband, a Frenchman, works at the Poznań University of Technology, and his presence gives his Polish colleagues a chance to find out about how the research world works elsewhere. But I think the dominant view is: “What do we need a Frenchman here for. Maybe he sometimes knows better, but who cares. Our system works as we want it to and it suits us just fine!” We set our own criteria on a lower level, because it's easier that way.

It greatly pains me that scholarly work in Poland is geared towards quantity, rather than quality. It is not important which real achievements someone has, only how many publications they have in print. This is the reason for, for instance, authors' names being tacked onto the articles of others. Many people claim a contribution based on the use of a single technique or single measurement. The real point of this is that colleagues help each other out: if I add someone's name now, they will add mine later. It's a vicious circle. Things shouldn't work that way.

## Is that something that characterizes only science in Poland?

In France, where I have the most contacts, no one would think of doing such a thing.

## You are neither a small fish, nor do you swim in a little pond.

*(laughs)* I guess I am somewhat known abroad, since I get invited to lecture in Japan and America. And I am pleased that in a world online ballot, I was elected to chair a section of the International Society of Electro-

### Prof. Elżbieta Frąckowiak

is an electrochemist, working at the Institute of Chemistry and Technical Electrochemistry, Faculty of Chemical Technology, Poznań University of Technology. Her research centers on the storage and conversion of chemical into electrical energy, electrochemical capacitors, lithium-ion cells, fuel cells, and hydrogen electrosorption in carbon materials. The author of more than 150 publications, nearly twenty patents, and several dozen patent applications. As Vice President of the Polish Academy of Science, she oversees Division IV (Engineering Sciences).

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WOMEN IN SCIENCE

# FOR TIMID FISH



# ACADEMIA Focus on Attitudes

chemistry for six years. Also, becoming editor of the journal *Carbon* is a huge honor.

### How did you end up choosing electrochemistry?

It was essentially by chance. My dream in high school was to study English philology. I loved to memorize words out of the dictionary. But my teacher said that I should forget about it. Then, I somehow got drawn in by chemistry.

I was not an outstanding university student. The scientific bug didn't bite me until I was writing my master's thesis – which my supervisor, Prof. Edward Dutkiewicz, said could essentially have been a PhD thesis. He maintained contacts with Prof. Parsons in the UK, and I worked on software that had been imported from there especially for me. There was also the famous Prof. Zbigniew Galus from the University of Warsaw, who visited us to lecture.

However, knowing English did really come in useful, although my first international conferences were a linguistic shock.

The storage and conversion of energy became my fascination. There are two different sources. In our cellphones, for instance, we have lithium-ion batteries. Although the idea for them was developed in France, it was the Japanese who managed to make them a reality. But there are also cellphones that use lithium polymer batteries – my first one kept working for nearly 10 years! But perhaps manufacturers do not actually want the batteries to be of the best quality – preferring instead for customers to buy them more often. The other issue is that sometimes we expect too much from a battery, which after all contains a certain quantity of materials that can act as the cathode or anode. We can't get around this. A certain amount of energy can be obtained from a given material – and no more. As you can see, the subject I deal with is very topical and sparks emotional reactions.

success, which many people are now using. We hold various patents, but that does not mean that they are all leading a successful life, that the license was bought. For the time being, they are costing me money.

### What do you mean?

For patents to remain in effect, one has to pay a sizeable sum for each year of protection. And so I keep paying it, even though I'm sure any implementation is still a long way off. Industry has to be interested in buying it, but what is the battery industry like in Poland?

We have companies producing lithium-ion batteries, so there is not much interest in utilizing electrochemical capacitors, which are a rival technology. It is not easy to get something new to catch on. I would like to bring capacitors working in an aqueous medium to market, but making the transition from a small lab model to a large scale takes managerial skills which I do not have. Apart from that we cannot make a lot of models, or make something for sale; that's not the role of a technology university. There would have to be a large laboratory to make a prototype, which could be shown to some company that wants to buy it. All of that requires a bigger scale and money.

### Such problems paradoxically attest to your high position in science. How does one emerge into such deeper waters?

Perhaps it was a bit of luck that the small carbon nanotubes I studied ended up having many applications. I showed that they could be used in capacitors and fuel cells. But I think I really gained a lot from foreign cooperation, such as my stay at CNRS-Université d'Orléans. I think that every Pole should have contact with the outside world, to see how others work. By the way, I actually attained the qualification for professorship more quickly abroad than in Poland. Here, after delivering a lecture intended to launch my *habilitation* procedure, I was told: "The Faculty Council did not understand the lecture; your application to start the procedure is rejected." I cried and was depressed for a week, but then I thought: maybe I did talk in a way that was too specialized, too hermitic; after all, one of the listeners works in reactors, another in physical chemistry. Later I gave the same lecture again, however in more didactic form. The Council accepted it and I even got a prize from the minister for the *habilitation* thesis. You can talk one way to specialists in one field, but have to talk differently to researchers working in different areas.

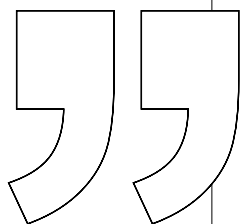
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### You have many patents and patent applications.

We could count up about 20 of them, such as for the technology of lithium ion sorption in carbon materials or (among the older ones), for a cell with hydrogen sorption, ways of applying a special electrolyte, or expanding the voltage of a circuit. Developing an electrolyte based on iodides proved to be a tremendous

### In Poland we think that physical sciences are a man's world. Are there a lot of women working in your field in other countries?

Not so many. This is visible, for instance, at invited lectures. In Japan, for instance, you can count the women participating at serious electrochemistry conferences on the fingers of a single hand.



## WOMEN IN SCIENCE

**In other words, a glass ceiling in science is not just a problem for our country?**

It is everywhere. Recently I was invited by the Embassy of Sweden to deliver a lecture on “Women in Science”; so I looked around for examples. There was Lise Meitner, who together with Otto Hahn discovered the fission of uranium, the nuclear reaction that makes atomic energy possible. He won the Nobel prize, whereas she was not even allowed to work in the lab itself. Her workplace was in the basement, and she had to use a toilet down the street, so that no one would see her. All of that, because she was Jewish and a woman. Marie Skłodowska-Curie, on the other hand, did receive a Nobel Prize, but paid a high price in terms of hard work and her own health.

**Women do not account for a high ratio of professors in Poland, only 21%, even though 60% of undergraduate students and 64% of master’s degree earners are female. This data is for 2014, but not much has changed since then. In March 2016, of the 1,674 titular professors in physical sciences, there were only 219 women like you, which makes for 13%. Why, in your view, do women more often lose out in the race for scientific titles?**

I do not think there’s a single clear-cut answer. On the one hand, when I was an undergraduate, the students were half male and half female. Later the best female colleagues around me somehow thinned out. On the other hand, I think that if someone resolves to become a professor, has talent and works hard, it will happen. Also, they must know how to reconcile a research career with family life, though that’s not easy. I think in the beginning my career came at the expense of my then-young daughter. I spent half a year at home with her, but then already starting working part time. When she was ill, I took her to the lab and hid her there, so my boss wouldn’t see her. He hated sick people and anyone taking off work to take care of children. I feel a bit guilty now about those times. And I have only one child, whereas if someone has several it’s definitely harder. Apart from that, if it’s somewhat more convenient, a husband and wife are both scientists. University working hours are flexible, research and teaching duties can be arranged somehow to trade off with one another.

**But family obligations are usually...**

...pushed onto us women, that’s true. But on the other hand, we are not penalized for this in competing for grants, for instance. Poland’s National Science Center, for instance, counts the time spent on maternity leave as part of a female researcher’s years of experience.

**So what is the problem, in that case?**

Perhaps it’s that we women do not know how to fight for ourselves? For instance, we do not apply for top positions in science, though we have the qualifications.

Statistics show that, up to the doctorate level, women and men are equally taken into consideration for managerial promotions; only in later career stages do we get passed over. Sometimes perhaps we bring it on ourselves, because we don’t have enough determination, being less interested in management positions than men. But sometimes it is really hard for us to push through. Whatever the causes, the effect is as it is. Unfortunately, this also applies to the Polish Academy of Sciences – not quite 5% of its members are women. A lady from the US Embassy even asked me recently: How is that possible?

Women sometimes don’t have enough determination, being less interested in management positions than men. But sometimes it is really hard for us to push through.

**Let’s be precise: of 350 members of the Academy, there are just 17 women. You are the second woman ever to hold the post of Vice President of the Academy.**

Even worse: in Division IV (Engineering Sciences), Prof. Bożena Kostek and I are the first women members in 60 years.

**How should this situation in Polish science be combatted?**

This does not seem to be something that could be regulated by parities, for instance, stipulating that 50% of management posts must be held by to women. But efforts to ensure greater opportunities would make sense. For instance, if there are two equally qualified candidates vying for a post, men need to wake up and not just support their male colleague at all costs. There should be less protectionism. Prof. Jerzy Duszyński, the President of the Academy, is a staunch advocate of such policies.

As for me, I am trying to back two women in the elections of new members of Division IV. I consider them very good. We will see whether the men appreciate that.

I definitely support this approach: when there are good female candidates, they should be promoted to top posts. Otherwise the dominance of men will be insurmountable.

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