Science without frontiers

An interview with Torsten Wiesel, Nobel Laureate and Secretary General of the Human Frontier Science Program

EMBO reports (ER): It is now two years since the publication of the “A tree full of the fruits of opportunity” article about new career options in the natural sciences (Wiesel T, Banda E (2002) *EMBO Rep* 3: 906–910). Do you think this has had an impact?

Torsten Wiesel (TW): I don’t know. Many people have commented that they found it very useful. It seems that people are more interested in science education now.

ER: One point highlighted in the article was the decreasing number of students in science and engineering. Do you see this as an increasingly serious problem?

TW: You generally hear both in Europe and the United States, and even in Japan, that young people are no longer interested in science. So our purpose was to point out to young people that you may not end up being a scientist, but in order to have a wide choice of professions you need to have a strong background in science. If you’re going to work for an insurance company, for example, or if you’re going to be in investment banking, you need to have a basic understanding of science.

ER: But you still need the people who carry out research in the laboratory, and you need to support them.

TW: That’s less of a problem once students learn about the excitement and opportunities in science. Most people tend to stay in academia if they can get a good position. But I’m still a romantic person in the sense that I think that science, like art, requires imagination and creativity. Curiosity should be the basic reason why we go into science, and why we try to understand complex things.

ER: But don’t you think things like the Human Genome Project can help to make science more exciting to young people?

TW: I don’t think so. In my view, there are many fields in science that may not be the most creative, even though they are necessary. But some people like doing boring things. I don’t think you have one kind of scientist—we have different interests in music or art or science. You want to create opportunities for people to do what they are interested in, and not regiment them.

ER: But most postdocs are still underpaid, do not receive benefits and have short-term contracts, which is why many of them leave

academic science. Do you think the postdoc position should be improved?

TW: I think it is rather hard to be a graduate student because you have to finish in a given time, and your project must be approved by your professor and reviewers and so on. The postdoc period is usually the best time because you learn new things, and there is no specific requirement except to get involved in the science. That’s a

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perspective that one shouldn't forget. Of course, some postdocs do not succeed in their experimental work—it could be the advisor's fault, it could be the student's fault, or it could be that both parties play a part. I look at the problem as for an artist—if you go to art school to become a painter and you don't have what it takes, then you should do something else. There has to be that aspect in science too. Not every postdoc should necessarily expect to succeed within academic science. And that's why we used the tree analogy in the report mentioned earlier—there are so many different directions to go in, so that even if you don't succeed in getting an academic position, there are still a lot of options, and you have not wasted your time.

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But I think the problem is not at that level. Many universities, at least in the USA, are now trying to pay more attention to their postdoctoral students. When I was a postdoc, I was happy that nobody paid me any attention because I could do what I wanted. Some postdocs are probably being taken advantage of as cheap labour. A lot of labs couldn't function without graduate students and postdocs to do the work. A lot of the time, postdocs feel that they're being used, and in the end they have a hard time finding a job or a new lab where they can take their project further. I have tried to introduce the idea that if you have a three-year postdoc fellowship, in the last year the student should be given the opportunity to develop his or her own project, so that when taking a new job he or she can actually write a grant and get started right away.

ER: But that's not the reality for most postdocs.

TW: Not usually.

ER: Do you think that universities should change some of their procedures?

TW: I don't know. The culture is that scientists often put their names to papers

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mainly because they have given financial support to the project. It's hard to legislate ethics. And fields are different. If you're a molecular biologist, you have a lot of people working for you, so it's harder for you not to put your name on a paper. I'm not moralistic. I think the best thing is to have good role models and people in a responsible position who are willing to say this is the way it should be done, but not legislate. Europe has brought in too much legislation, and it makes things more complicated. One of the main problems in Europe and Japan is that if you've finished your postdoc, it is very difficult to find a job where you get your own lab space and money for research. There are too few independent positions at the level of assistant professor with what we in the USA call tenure track, through which you get start-up money, space and three years' commitment. At Rockefeller University, it used to take about a million dollars for a three-year commitment, including start-up money, salary, a postdoctoral technician and lab support. That's a major investment, so you have to be sure that the person you recruit is good. But this is the risk you have to take.

ER: What do you think about changing education in science to train people as teams and not as individuals?

TW: There are still a lot of interesting problems in biology that you have to solve on an individual basis. For some projects, teamwork is probably good, and in industry it's clearly good. The sequencing of the genome, proteomics and all those related fields are industrial, to my mind. We shouldn't ignore the fact that science is still an intellectual challenge, with individual scientists trying to solve problems. I'm trying very hard to see that the Human Frontier Science Program [HFSP] supports risk-taking projects carried out by the very best scientists in the world and trains the best postdoctoral researchers in the life sciences.

ER: You commented once (Wiesel T (2000) *Science* 289: 867) about the imbalance

between European postdocs eager to go to the USA and American postdocs who were reluctant to leave. Has the situation worsened since then?

TW: Actually, in the past couple of years, a few more US students have wanted to go to Europe for training. It could be the political situation, it could also be that European labs are getting better. I just think it's good for students to get out of their country and be exposed to other cultures and experiences. After the Second World War, a lot of students from the US went to Europe for training. I would like that to happen again.

ER: So the situation is improving?

TW: No, it's still only a few per cent of American students who apply to go abroad. The flow of students going to the USA is still overwhelming.

ER: How important do you think international mobility is for scientists?

TW: Science is international. The language of science is international. I think science has always been independent of our country of origin. That's why I was very upset about a proposal for a moratorium on collaborations with scientists in Israel. It was a stupid idea, because science should not be involved in politics but should solve problems. And I think the fellowship programmes are good because going to a different country enriches you. We all like to travel and to see different cultures and environments, so if you can do that and combine it with your education, that's good.

ER: The problem for many developing countries is that most of their scientists do not come back.

TW: There is a foundation in the USA called the Pew Foundation, and I've been part of its Latin-American programme for over ten years. Postdocs come to the USA for two years and they get US\$35,000 to go back home to set up a lab. That's all they get and still over 80% of the students go back home in contrast to less than 50% in the HFSP postdoctoral programme. You can say that Latin America is not an underdeveloped region, but it certainly does not have the resources supporting science compared with other regions.

Similarly, in Eastern Europe, if these countries were provided opportunities, they would soon become as competitive as any other nation. People talk about the developing world as if it were one thing, but there are great differences from country to country. For example, there is very good basic education in Iran; they have some very good scientists.

ER: Iran now has the highest increase in scientific output worldwide.

TW: And China and Korea are obviously moving strongly in the sciences, and Indonesia and Malaysia are on the move. These are countries with resources. Africa is of course what people now focus on, but I'd like to see to it that each country receives assistance on the basis of need. You can also make the argument that if you want to have a global economy, you need educated people in all countries, because if you move an industry somewhere, you need trained people. So it's in the interest of the global economy that science and training and education in

science are developed. It's like the Marshall Plan after the Second World War; it was very important for Europe, but the plan also helped to create a market for the United States.

ER: Speaking of the moratorium, do you see a similar sentiment now in the Middle East with the current political situation in the Gulf?

TW: I don't think so. I think that the Middle East in terms of science has been a problem area for a long time. Before the civil war in Lebanon, the American University in Beirut had a graduate programme and a masters programme, in addition to a medical school. Actually, it was the only graduate school in the Middle East at the time. And that was destroyed. The medical school is still there, but if you are from Arab countries, getting good training in medicine or sciences is not easy. You more or less have to go abroad. What's happened there is a tragedy.

ER: Nevertheless, countries like Iran and Cuba are quite good at carrying out scien-

tific research but are suffering from a political situation. It's nearly impossible for their students to go to the United States. This is a *de facto* boycott, similar to the moratorium on Israel.

TW: With Israel it was just a matter of the moratorium on collaborations that already exist. The fact is that a large number of Israeli scientists are very happy to collaborate with Palestinian scientists. There used to be more interaction between Iran and the USA, but the whole of the Middle East is a wasteland in terms of science not just because of American policy. You know, Saudi Arabia hasn't exactly been forthcoming in supporting basic science and that is the same for all of the rich countries in the region.

ER: Is there anything that funding agencies can do to change this situation?

TW: I think that government agencies and private foundations in European countries could provide support to Iran, whereas today this would not be possible for the USA.

ER: One effect of terrorism is that the US government has increased its visa requirements for foreign students, and restricted access to certain types of research. That has created an intense debate in the USA about their attraction for foreign students. Do you see this as an increasing problem?

TW: It is a problem. The science community is working through the National Academy of Sciences with the US State Department, and some progress is reported in providing better opportunities for scientists to get visas. Currently, there is a tendency not to have scientific meetings in the USA because of the visa problem, which is obviously very harmful. Many of us came to the USA because of the rich opportunities in science.

ER: They're even cracking down on Americans, like Thomas Butler, something you spoke out about as a member of the National Academy of Sciences' Human Rights Committee.

TW: That's another whole area that I've been involved in for many years. The Wen Ho Lee case was the first US case we became involved in. We worked through the presidents of the academies to exert pressure on the Justice Department and on the Attorney General. In the Butler case, we have tried to help through the committee and through our members in the academy. Unfortunately, Butler recently received a two-year prison sentence, even though the judge actually went out of his way to be lenient. We are now worried that his appeal could lead to an increased sentence because of a counter-appeal by the Justice Department.

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ER: What impact do you think cases like that have on the scientific community?

TW: It's complicated. The *Science* article (Enserink M, Malakoff D (2003) *Science* **302**: 2054–2063) gave the impression that he cheated in paying overheads on some of his grants. So some colleagues that I've spoken to, and members of the academies, have mixed feelings. In the Wen Ho Lee case, there was very solid support from everywhere. With the Butler case, it's somewhat complicated because of all the other allegations that have nothing to do with the charge that he transported biological material unlawfully.

ER: What current problems do you see for science in Europe?

TW: Close to my other interests, and the reason why I joined the Human Frontier Science Program, is my wish to change the support of science in many countries and particularly to foster opportunities for young scientists to carry out independent research. Europe is not doing as well as the USA, not because of lack of talent, but because of lack of flexibility in the support system.

ER: Would it help if European universities adopted the American tenure system?

TW: I think tenure should be limited because in most jobs you don't receive it. If you're a scientist and you're hired to carry out

research, you have to have research grants. Now if you suddenly run out of ideas and your science isn't going anywhere and you get no grants, then why should the university keep on paying you a salary for 10, 20 years if you are not productive? It's like a concert pianist—if you don't play well, you're not going to give big concerts. That's the way life is. The reason for tenure initially was that people wanted to protect political freedom if you had a point of view that differed from that of the government or the administration. But in the world of science, that's not a problem in general. I am in favour of five-year contracts; if you do a good job, the contract will be renewed. I'm more interested in trying to create opportunities than having tenure systems. If you are in France or Germany and you are appointed professor, this is more or less a permanent position, whereas in the USA, your position is reviewed after three, four or five years depending on the institute. If you're promoted to associate professor, you'll have another review after another five years. At Harvard University, it takes up to 11 years before the decision about a permanent contract must be made, and at Rockefeller University it's about 10 years, but it varies according to the institution. But this gives the researcher sufficient time to establish himself or herself and show that he or she really has the goods before receiving tenure. So that's the change I'd recommend, if tenure is maintained. My preference is still to have renewable contracts.

ER: Professor Wiesel, thank you for the interview.

The interview was conducted by Holger Breithaupt and Caroline Hadley.

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