Outcome of the GENERA interview series

previous

3. Mobility, migration and internationalization of science

International cooperation supported by mobility is key to scientific knowledge production in physics

The development of science is attributed by researched physicists to the exchange of ideas that today happens also internationally, within the thematic - formal or informal - networks or groups (see also chapter “Networks”). The need to moving internationally for working with high quality mentors or supervisors, sharing ideas, and equipment is a **part of culture of physics as a field.** The mobility experiences link researchers to each other and create a net of international connections between them that are important for establishing further institutional or personal cooperation leading to common publications and projects.

- *It is a field of action where you cannot work by yourself. You need to collaborate, change ideas and experiments. 76_F*
- *The development of physics is unthinkable without mobility, cooperative work, sharing results and apparatus. (...) in physics every result must be consulted, compared, argued. (...) today it is unimaginable to do anything without a broader consultation with the scientific community, there is no such laboratory or college that could do it well without journeys and without exchange of thoughts. 58_F_L*
- *I think it's [mobility] really important, we need collaborations...it helps in order to expand your knowledge and expand your experience. 05_F*
- *[Mobility and migration] are of great importance in my field, I can speak only about my sub-discipline - nuclear physics and hadron physics. [...] The infrastructure that we need [for the research] is available in only a dozen or so locations around the world, so it's a practical aspect that our research can be done in specific centers. It is difficult to build a [research] group with all the necessary competences and skills within a single research center. So these groups have to be built so that we all meet together. 61_F*

The need to **use advanced and expensive infrastructure** forces physicists from certain sub-disciplines (e.g. nuclear physics, hadron physics) to travel to specific locations. For instance, CERN - the European Organization for Nuclear Research - is mentioned as a remarkable example of **necessity to collaborate in science** - stressing that physics cannot be funded by one country, but only through joint efforts and financial resources of many countries:

- *Particularly in physics area, you need to travel because we are more and more working in huge international collaboration, as no one country can pay alone for the experiment we are working on. Look at the CERN for example: how could Swiss finance alone such a project? 35_M*

International mobility is perceived **as a crucial element of science development**. As such, international mobility allows, especially in the narratives of younger respondents (also representing emerging subfields of physics), to exchange knowledge, perspectives, experiences and methods of conducting research:

- *It's a good chance to exchange ideas. When you go to visit different laboratories, meet new physicist, it's the occasion to enlarge your knowledge and research. 36_F*
- *Mobility is something positive because you can learn things abroad and then apply them here but I do not think mobility should be compulsory. 26_F*
- *(...) during two scientific conferences I met two professors, one from Italy, the other from Ireland, who opened my eyes and perspectives a little, and thanks to them I proposed my professor to use new research methods that widen [our] perspective and expand what is synthesized and studied. 57_F*
- *It is important to experience different dynamics and manners of conducting research. 03_M*

Some of the senior researchers in contrast have doubts if mobility is essential for science development and instead emphasize **the role of internet communication that substitutes mobility** at least to some extent. Contrastingly, the internet resources are also indicated as extensive thus impermeable and that through contact one can learn better on the important developments.

- *If it [mobility] did help the science, so as well, but if it is crucial, I am not so sure. So I think you can very well work in one place and regularly go to conferences and always communicate with people via Skype, E-Mail as well. And everybody receives the papers that are published every day, everywhere on the planet. 09_M*
- *[Mobility] allows me to see how you can work for real and this is a matter of gaining new models and new perspectives, so sitting in one place is good for nobody (...). Scientific community has sense only in case when people contact each other. Especially that amount of information being a result of published articles is that you cannot get to what is valuable, I've got a feeling that you can get it by meeting people and talking with them. 57_F*

Indicating excellence: mobility is a must in a scientific career

Mobility is also a crucial tool for supporting scientists' development - multiple benefits of mobility were mentioned by the physicists. On the one hand, the plausible outcomes concern the expanding of scientific knowledge, learning from the excellent scientists or supervisors abroad, and creating connections. On the other hand, the interviewees underline personal development of a scientist: gaining self-confidence or independence, learning new ways of perceiving the social and professional world, including improving social skills. Travelling is also a way to learn about diverse organizational practices and institutional cultures of working - these experiences are valuable at the leading senior positions.

- *Absolutely, I mean, besides entirely exceptional situations, it is necessary. One has to change surroundings, change the atmosphere, see how work is done elsewhere, work with other people, with other groups. This brings another perspective, change of working style, seeing how work is done in the best centres, because a lot of people go to the best centres. This is essential, I cannot imagine a person that would sit in one place and 'poked' something. 54_M_L*
- *Flexibility is extremely important because it shows you a new point of view. You can see your*

research world as external, you learn working in different field of work where there are lots of funds, there is high competition and there are lots of young researchers. In the north of Europe also you get through reality much more dynamics, and this is fundamental for a researcher. Obviously, it enriches your skills. 39_F

- *Here, during the recruitment process there is a lot of attention being paid to the fact if someone was abroad, for a longer time, because if s/he was abroad it means s/he is cool! But if somebody was sitting here teaching students than s/he is not so cool (...). I don't like lack of flexibility in this matter. I understand that it is necessary to go somewhere and check how it is to work elsewhere, but I don't know if this kind of uncritical look on a man who could have worked anywhere abroad and is evaluated better, is good?* 55_F*.*

Many scientists mention the opportunity to widening horizons - stressing **the "opening eyes" effect** that could happen when visiting foreign institutions or meeting excellent researchers in other countries. The local cultures of science production can be questioned in light of such comparisons:

- *Lack of awareness [that there are different research paths in physics than in one's home department] results in stereotyping and reluctance (...) In 2006 I went for my first conference of physics didactics and it opened my eyes to the fact that (...) people do research on physics didactics, because I had not known that earlier and then I thought "let's do this too". 56_F*

Mobility is considered as one of core elements of **excellence** - it constitutes a criterion important in evaluation of scientific performance, and it creates new standards for participation in research. Such understanding of mobility lies in underlined significance of close collaboration with foreign and international research organizations, especially visible in implementation of the project-based studies. Being mobile and having experiences of international cooperation is positively evaluated during applying for research grants or job positions. In some countries, e.g. Germany, it is **impossible to progress in a career without mobility experience.** In the Netherlands one is supposed to spend a year or more abroad during a post-doc time, while for example in Poland it is not compulsory, but in the studied research institute it is strongly recommended.

- *You cannot perform if you don't go to conferences, workshops. You need to be part of the culture, otherwise you cannot get it. 82_M*
- *You need to have mobility, otherwise you won't get a position. It is also important for your image. 27_F*
- *Without moving you probably won't get a job. But also it's how you meet the other people in your field. You get to know other ways of doing science. The atmosphere is different, the people are different. I think it is important to see that. 01_F*
- *Yes, um, you do not have to study somewhere else, but you have to, so that is what colleagues told me, that you have to have experiences abroad at some point. It can be as a post-doc, that you go abroad, but you should do it. 08_F*

Situating mobility in the career path - it's for the young

International mobility is often depicted in the narratives as a **crucial factor for the career development**, yet its intensity is mostly related with early stages of the career. It is important to notice that *mobility* means both to short term mobility (e.g. research visits, conference attendance, experiments periods), but also longer periods abroad - here it is mostly linked to PhD or post-doc positions of duration from 1 to 4 years. Another form of geographical mobility is actual migration -

here meaning, moving to settle in a different country for a longer fixed position.

It is important to underline that demands for mobility **depend on the moment of the career**, similarly as the engagement in the mobility - the senior respondents usually stressed that they have other obligations (such as administrative duties) that disallow their engagement in intensive mobility. Thus, young researchers are those who are “on the move” - engaged in short and long-term mobility periods, as well as migrating in search for employment opportunities. The need for visiting other research centers and participation in international forums and research projects is mostly **assigned to young scholars and researchers**, who are obliged/supposed to travel and cooperate closely with foreign research institutions and teams. The period after completion of PhD, so called *post-doc*, is considered as very good chance to stay for longer in a foreign institution. These early career experiences, if gained in an excellent institution, favorable environment and under quality supervision, are indicated as decisive for the whole career. In the biographical accounts of researchers the connections created at the start of career tend to last for many years and are often developed into institutionalized forms of collaboration. We could assume that in case of young scientists (especially female) that cannot move after their PhD missing opportunity for a post-doc experience could have a degrading, even if indirect, effect on the career.

- *Travel shapes the young. Personally I was really happy to move in another country. Most of the time, when you are student, you don't have a lot of constraints and it's really a rewarding experience to travel. 33_M*
- *One should travel, because it's good for one's scientific experience, it's also a new knowledge. [Travelling during post-doc] is good for a young person, because he/she can see how people work , and you can bring something good from there. And it's also good when you find new collaborators there, during post-docs long-term cooperation may start. 62_M*

Some young scientists notice that mobility “counts for” career only after receiving the PhD (e.g. in the Netherlands you are supposed to spend a year or more abroad during your post doc time).

- *Yes, it [mobility] is very well received. And that is what is funny, because originally I wanted. I mean, I studied in Xxx [country in Europe] and then I also went to Xxx [country outside Europe] and then I was here and, that means that I have already worked in my three countries, but now that is disregarded somehow, because it only counts starting from your PhD somehow. 07_F*

Reconciling mobility and private life - gendered perspective

The mobility expectation is more difficult to realize for women, as the moment when it is expected to happen (after PhD) coincides with time of family formation and childbearing. In result, the high value of mobility in evaluation may be damaging for those for whom mobility is impossible or challenging. Besides women in their family formation phase, there is a one case of a scientist from outside Europe that could not leave during PhD studies due to lack of passport - she also indicates the importance of mobility for self-development as a scientist at the early stage of the career. Another group that has more difficulties in travelling is those in administrative and leading positions, who point to the burden of daily matters as disallowing frequent mobility and making long term mobility impossible.

Considering short term mobility, the difficulty for travelling lies in family and care duties, especially in relation to care over small children, but also in later stages of career for elderly parents. In fact, the short term mobility is seen often as a challenge by women scientists, who needed to manage family and care duties (also in case of a single father). The support from the partner or other family members is seen as critical. Nevertheless, some female scientists conclude that they limit their

travels to those necessary.

- *Before I used to move a lot, I really enjoyed it: conferences, workshop, colloquium... every time I had the opportunity to travel, I moved. Now, with a baby, of course it's more complicated. I need to check with my companion if he can take care of our child while I'm away, so I try to leave only when it's really necessary. 34_F*
- *Such a dramatic picture that I can tell you is that at one point in my work the analysis [I performed] was completely closed and I wanted to consult it with my [...] mentor, such direct supervisor, I wanted to present him [the results] in detail and more deepened way than by email. I decided to go to Xxx [country in Europe], it was a 3-days trip, so I wasn't at home for 3 days, and that was the period when I breastfed and it was probably the most dramatic period of my life. As I returned the baby literally jumped on me. So these dramatic memories of those 3 days, those swollen breasts and that baby on the other hand at home, it was pretty dramatic. 61_F*
- *In my case my family problems were at the base of not having periods abroad [Xx is a single father]. 42_M*

The actual challenges linked to mobility, even if they are managed by the female scientists with usage of informal resources, may have adverse effects and bring upon an image of them as inaccessible. A researcher from Switzerland, describes that she almost was not invited to give a lecture, because organizers did not want to cause her trouble in organization of family life. Such “favours” may have a degrading and excluding effect on career of female physicists isolating them from environment and prestigious activities.

- *I used to travel a lot. Now I have my son, I don't travel that much. But if it just 2 or 3 days I am happy to go give a seminar. In fact when I have been asked I go. I was quite shocked last time I went, the organizer heard I gave good seminars, so he invited me, but he told me “I know that you have a kid so I was very hesitant to invite you. I didn't want to put you in a difficult situation”. You would never say that to a guy that has a kid right? 05_F*

In case of long term mobility, the experience of female researchers is more similar to those of male ones, as the representatives of both genders experienced difficulties in mobility for longer periods (or migration decision) when having family rooted in a certain location. This includes especially situation of a partner being employed, children attached to schools, but also challenge in adaptation every time when changing jobs. For some men it is easier to make decision to move to another country if a wife does not work professionally or if her occupation is perceived as less important or valuable. Women often stress that the professional career of a partner disallows them to migrate or leave for longer period. The social expectation of a woman following man career demands, plays in favor of men physicists, nevertheless even some male respondents see impossibility of de-rooting their family through migration abroad or resigned from longer stay when children were small or had health problems.

- *I like to move, experiencing my stay in [name of the country] it's really great. But it depends of the age of the people: for me the mobility was not a problem, but now I would more hesitate to leave Xxx [name of the country] for another country. 33_M*
- *When my [male] colleagues decided to do internships abroad, they took the whole family with them and it was one year internship, and that was not a problem, because their wives could take a break at work or they did not work, so for them it was possible to take care of children at a new place, take care of them so they could adopt a new environment. I have a lot of support from my husband, but I cannot imagine him leaving his work or having a break, and I cannot*

imagine me asking him to put off his job for a year and come with me because it's important to me. 61_F

- *Mobility for long periods is challenging from a human point of view. In my offsite experience, it would have been even more difficult because it would have led me away from my family. 46_F*
- *Anyway it is a disadvantage, [...] you have to assume that you cannot stay at [name of institution] your whole life. And due to the fact that you are very, very specialized in a specific field, it will be improbably that you really find a job here. Nope, that means, you really have to change completely. Additionally, local where you move to. And the partner also plays a big role in it. Or when you have a family at that point, you just pull out the children from their community. I believe, that is [...] maybe one of the biggest problems in science that you have to be extremely flexible including everyone around you. Well, that means if you have a family, everyone needs to be flexible as well. 20_M_L*

Dual career couples - a double challenge of mobility

The particular situation concerned dual-career couples, which is quite common in physics (cf. McNeil, Sher 1999). Having a partner also working in the physics field, or being a researcher in the other field, was evaluated in general very positively - such a person understand the way of working in science, has similar interests and can give advice. Nevertheless, for such couples mobility and migration decisions are challenging. The decision of moving depend on how possible it is for both of the partners to benefit from migration. The cultural expectation towards women to follow her partner matters and some women indicated that going abroad in such situations meant to them e.g. a career break or volunteer work. Nevertheless, there were also cases when men decided to move to another country to support partner in her career.

- *I stayed 4 years abroad in Europe, and 4 years in Xxx [country outside Europe], because my husband was moved for working and I tried always to follow him. We were good in combining our jobs. (...) Once I took a leave from work without pay because my director didn't want me to work abroad. 40_F*
- *After MA graduation, I got married and we moved abroad. My husband worked in a university and I had a break. 70_F*
- *I should probably also say that I have a boyfriend in Xx [country], who is working at the Xx [institution]. So that was another plus. For my work-life balance that was another draw to go back to the Xx [institution]. 10_F*

The following account of a man who decided to leave academia puts in question the pressure to move, and describes the difficulties that a couple of two physicists face. In the relationship the wife's career had priority, and ultimately the man dropped out. He questions the sacrifice of one's private life to science, as due to long-distance relationships, certain family decisions are put on hold (e.g. children, house). Possibility to work long-distance was indicated as a partial remedy:

Two scientific careers meant that since September 2012 we have not been living together. (...) As such we are a typical example of the two-body problem. (...) We try to cope to see each other every weekend (meaning that we travel a lot), meaning that we have almost no time for other hobbies or visiting friends and family in our home country. Luckily, my boss (...) was very supportive in our situation and allowed me to work regularly from home (...) As a consequence, we have put many other things (like having children or buying a house) on hold. (...) In the beginning that (working in different countries and long distance relationship) was quite ok, but now I see people around me

having moved on in their lives, whereas I now feel we are falling behind. This really makes you wonder if you did anything wrong, made the wrong choices. Is a scientific career worth everything? 52_M

Excessive burden of (forced) mobility - in a search of permanent positions

The new context of **scientific career demands high mobility from the young researchers**, including not only short term mobility or post-doc research stays. In fact, it is a "scientific labour market" that demands from researchers frequent change locations - young researchers move around Europe in the search of fixed (or at least fixed for few years) job positions. There are cases in our study of those who moved to a foreign country to permanent post, which did not demand from them further moving - this pattern was usually evaluated positively. At the same time, some interviewed scientists are "on the move" for many years - every few years they need to move to a new country and new institution. This brings upon frustration, stress and feeling of instability. The unpredictability of employment and the inability to plan even a country where one would work lower the evaluation of the career and may lead to abandoning of academia. Researchers stress that they cannot stay in the institution they would want to work for. It also causes difficulties in integration in the research teams, so critical for physics. This is discussed more in the chapter "Career paths...".

- *After the PhD, you will normally spend around 15 years with 2 or 3 years-contracts and moving all over the world. This is not a very attractive career prospect. 30_M*
- *[Mobility] It's not a necessity. It's a good experience, but it has maybe to stay time-limited. For me my post-doc experience was really wonderful, my partner followed me even if he didn't have a job, it was our couple project to live something else for 2 years. But if it had gone on more and more years, it would probably have become a problem. When I see people who are doing their 7th post-doc in a 7th different country... I don't know how they can live like this; in my opinion I would have left the job if I had to work in such terrible conditions. 34_F*
- *I liked arriving to Xxx because it was after years of moving, moving, moving, moving.... 27_F*
- *This time I decided I had to move in order to continue with my career. In spite of the fact that my partner was here, I spent several years abroad. (...) It was a personal sacrifice but it was very positive because I worked and published a lot. 26_F*
- *It is necessary on the CV. But to be honest, is it really necessary in the point of view of how much you can learn, I have my doubt... I mean, of course you learn different things in different places. But based on my experience on my 2 years post-doc, basically you arrive in a place, you have to adapt, and the time you realize you are there you are already gone. When you speak with people who have permanent position, who are in their job for 20 years, for them 2 years is just ridiculous, they don't even think about starting a project in such a short time. I like to move around, but I would like to have more choice about the country and how long I could stay. 37_F*

The feeling that mobility is "forced" is not received well. Young researchers especially emphasized that it should be **possible to stay in the same country after completing one's PhD**. There might be no added value of moving between countries for the only reason that scholarships and funding are not available at the current location. This is stressed by the researched physicists in Germany, Switzerland and Spain. Let us stress that this intensive mobility is difficult for those with families and children. In some cases, the instability of career led to postponement of childbearing.

- *I have done my PhD here. Now I am doing a post-doc and now, um, I do not have any opportunities to stay in ..., because I have been here for so long. And now I have to leave again.*

It is really stupid. (...) That means I am here and I cannot stay, because I have been here for too long and now I can also not go back to (another country), because I know no one there who would hire me. 07_F

- *(...) a PhD student asked me if he could get a professorship just living in Northern Germany. I said it would be great if you could, but it would be absolutely impossible. You have to move countries. So for them, for that person, they know that their partner won't want to move, so they won't be a professor. And this is just - it's unfortunate, but it's so unlikely you could ever be a professor without having moved around. 10_F*
- *After my post-doc I would have been happy to stay in Xxx [name of a country] if there had been a good opportunity there, instead I found a position in Xxx [country] and I have stayed here since. 03_M*

The scientists specify as well **difficulties with management of their careers due to different mobility cultures**. While it may appear that mobility is embedded in doing physics in European institutions, in fact mobility patterns differ between countries. As underlined in the chapter “Career paths...”, in some countries the interviewees usually stay all their lives in one institution (e.g. Poland, Italy, Romania) experiencing travels, even long term, as “business trips”. In other countries e.g. Germany, France, Switzerland, or Netherlands their paths are much diversified. The age is also an important category, definitely showing the generational differences in being a physicist - those who face the precarious labour market in the recent years, have a different experience of scientific path than those in senior positions. Now the scientific career is often filled with uncertainty over their careers and potential employment.

- *(...) every time I need to build up a new network in a new country, which has slowed me down so much, that I ended up having a backlog on the career path to those you remained safe and sound at their PhD-institutes. 52_M*
- *That means I am here and I cannot stay, because I have been here for too long and now I can also not go back to Xxx [name of a country], because I know no one there who would hire me. 07_F*
- *At [our institution] I think mobility is evaluated in contradictory way: I mean sometime getting back from an external period would have [been] very difficult in terms of getting again the position. Now I think things are getting better, mobility is better evaluated. 42_M*

The **integration of mobility within one's career path is a challenge** - this demands from a researcher having strategic thinking skills, as well as good supervision (see also chapter on “Work conditions and environment”). There are also different opinions about the best time to do the longer research stay abroad. The strategies differ depending on where one wanted to end up, as it revealed that depending on a country the decision to go abroad or not may be decisive for future employment opportunities. In some countries - the PhD phase is the most suitable, e.g. in Germany, as you are supposed to come back to Germany with foreign experiences, while for example a French-origin researcher claims that in case of France doing PhD outside France puts you at disadvantage. The case of young female scientist illustrates well the confusing employment (written and non-written) regulations:

- *So there are not that many post-doc positions and many post-doc positions are basically financed through single scholarships and now I cannot get one of those anymore, because they are all for foreigners, (...) so you are not allowed to be in X [name of the country] for so long to get those. (..) That is now, that is the only thing I can do, is apply for a Xxx [name of the institution] grant or something like that. But that's something I am not able to do as a young*

post-doc. (...) and now, for example, when I go back to France, I do not know anyone. That means the chance, so the probability, that I find a job is practically zero. Because everything works with like insider relationships [Old Boys Networks]. So you will never get in if you do not know the professors, if you do not know the group, if you did not study there. Everyone knows that. So that means if I want to go back to [name of the country], I even have a disadvantage, because I did my PhD abroad. 07_F