



AN INTERVIEW WITH LARS-ERIK PERSSON

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ABSTRACT. On the occasion of his 65th birthday, we had an interview with Professor Lars-Erik Persson. We present several questions in this interview together with his answers. Some of the answers are indeed surprising also to us who know him well.

1. INTRODUCTION

On the occasion of the 65th birthday of professor Lars-Erik Persson in June 2009 the Department of Mathematics of Luleå University of Technology and Narvik University, Norway, organized the conference *Analysis, Inequalities and Homogenization Theory (AIHT)–midnightsun conference in honor of Professor Lars-Erik Persson on the occasion of his 65th birthday*, June 8–11, 2009, Luleå, Sweden. The main organizer–Lech Maligranda–gave the first plenary lecture about him entitled *Lars-Erik Persson – the man and his work* and has also written a corresponding article in this volume. We can find some selected information about him and his work in the article above and also some interesting complementary information here. More exactly, we hereby present an interview with Professor Lars-Erik Persson including 22 questions and his answers. Some of his answers are indeed surprising also to us who know him well.

2. INTERVIEW

• 1. Please tell us about yourself.

Date: Received: 15 February 2010; Accepted: 10 April 2010.

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2000 *Mathematics Subject Classification.* Primary 01A99; Secondary 01A60, 01A61.

Key words and phrases. History of mathematics, interview, Lars-Erik Persson.



Photo 1 (left): Conference MIA2008, Croatia: Moslehian (left) & Maligranda (right)
 Photo 2 (right): Enthusiastic LEP. His favorite picture from 2008.

★ I was born in 1944 in a very little village (Svanabyn) in north of Sweden in a very poor family without any academic tradition. In fact, it was only six years of basic school in this village. I was the first one from the village who has entered secondary school in Dorotea, 30 km from the village. This was maybe the biggest step in my life. In fact, I decided myself to do that and my mother helped me so I could stay in the house of a wonderful medical doctor there (Sten Strömbom). He became quickly my first supporter, mentor and coach. I learnt a lot during this miracle period both concerning the wonderful subjects at the school and also concerning life and my possibilities for the future e.g. that there existed something called university. After this very important part of my life I have had no disadvantage of my poor background, I can almost say the opposite. I think this made me very strong and more grateful than almost all other people, who has entered the academic world. Without this period I have had no chance to get the unique possibility I have got, namely to work with the most beautiful and wonderful subject which exists, namely mathematics. I can only use the term miracle, thank you God, my mother and Sten Strömbom for this.

I heard that many people describe me as very friendly and collaborative with a deep understanding of other people and their problems. In particular, I believe that most of my PhD students see me not only as their supervisor but also as their coach for life. I also think people regard me as unusually enthusiastic for everything I do and believe in, and there mathematics has a central role. I strongly believe that the miracle period described above has strongly contributed to all of this.

I have been married two times. I have three children with my first wife and two with my second one. Summing up, I have been in the lucky situation to have had two very good wives and five wonderful children and nowadays also four grandchildren.

- **2. Please tell us something about your education and career.**

★ After secondary school in Dorotea I went myself to Östersund in the middle of Sweden to continue my studies at the natural science gymnasium. Also this was a fairly big step for me. I succeeded very well at school but the economy was very bad so all the times I worked in different ways to get some additional money (e.g. in the forest in summers and sometimes even for the local newspaper).

After this I did my military service in Umeå and later I entered the university in the same town in education with the aim to be a teacher in mathematics and physics at the gymnasium. But already after my first year at the university and after some mathematical exams I was contacted by people at the Department of Mathematics and they offered me a part-time position as "amanuens" (help teacher) for the next year. This was of course very surprising and important for me. I finalized my teacher exam in 1970 but worked part-time at the Department of Mathematics all the time. The next very important step in my career was that Professor Ingemar Wik chose me to be the one he convinced the Department to employ as his first PhD student. I finalized my PhD exam in mathematics in 1974 and after that I got a one year position as Assistant Professor at the same Department.

Before 1975, I got a permanent position as Associate Professor at Luleå University of Technology. My first professorship in mathematics was at Narvik University, Norway, in 1992 and after that I was appointed on a position as full professor in mathematics at Luleå University of Technology in 1994 and this is still without comparison my main position even if I today also work part-time on various kinds of professorships at Uppsala University, Narvik University and Eurasian National University in Kazakhstan.

• 3. How did you get interested in mathematics?

★ Very early. My really first memory, when my special interest was discovered also by others, was when I once accompanied my mother to the shop in my homevillage Svanabyn at the age of 6. She bought something like 10-11 items and during the shopping I calculated the total cost. So when we should pay I informed about the correct sum but of course the responsible lady in the shop also calculated with her machine and congratulated me for my very good "guess". But after that my mother, who always supported me, continued to ask me to calculate in similar situations and as far as I remember I was always correct. Since I was born in a very small village the teaching at school was very individual and I was lucky to get a teacher who also supported my very special interest in mathematics and related things. In particular, I could borrow some of his own books and I was the first one in my homevillage who got the highest mark A (of totally 7 marks) already in class three. And when I later on moved to Dorotea to secondary school and there even got real problems to solve I clearly understood the magic attraction of our wonderful subject mathematics.

These early insights have always accompanied me and contributed to new exciting discoveries, and this is one of the most important ingredients that I really feel very happy when I look back in the mirror of my life so far.

• **4. Which mathematicians have influenced you especially much?**

★ This is the most difficult question in this interview. It is really many mathematicians who have been very important for me, see e.g. everything I have written about my wonderful collaborators (point 7 below) and PhD students (point 8 below) but also with this in mind I will mention a few names.

I was lucky to have a very good supervisor, namely Professor Ingemar Wik. I was his first PhD student and we almost worked together so therefore I learnt a lot from him not only mathematically but also his genuine enthusiasm and his insight on how to encourage students has influenced me a lot.

After my PhD I was almost adopted by Professor Jaak Peetre in Lund, and I visited him now and then and could freely stay in his house. He was really impressive for me and I learnt a lot during this period, not only in Interpolation Theory but also about his way to identify and solve new problems. In my opinion, he is as mathematician "system builder", he build up new important theories and does not care so much if the problems he must solve on the way are easy or hard to solve. This way of thinking has definitely influenced me a lot.

Jaak Peetre collaborated early with Professor Jacques-Louis Lions so I was via Jaak early also influenced by his ideas. Later on I also got the possibility to directly cooperate with him and the ideas I got from him when working with my new subject Homogenization Theory was crucial both for me and some of my students.

Later on during my work with Hardy Type Inequalities and their applications I have got the possibility to work very close during a long period with Professor Alois Kufner. We met for the first time in 1986. His genuine knowledge and generous way to involve me in many of his projects (articles, books, students, etc.) has been very important for me and influenced me a lot.

Here I also want to mention my friend Professor Lech Maligranda, who was my first co-author from abroad. We met already in 1983 and we have since then collaborated continuously in various ways. In particular, his deep knowledge in even the old literature and history of mathematics and his hard-working style has influenced me a lot.

Moreover, I want to mention Professor Ludmila Nikolova, who was my first female co-author. We met already something like 1985 and we have continuously cooperated since then.

Finally, I must say that my collaboration with Professor Vladimir Stepanov both concerning various kinds of inequalities and many joint PhD students has influenced me a lot, in particular during the last 7-8 years.

• **5. Tell us about the first article you published.**

★ It was the article *Integrability conditions on periodic functions related to their Fourier transforms*, J. Math. Anal. Appl. 44 (1973), 291–309. It was written during my PhD studies, and jointly with my supervisor Ingemar Wik. The background of this article was dramatic for me since I found a serious mistake

in a published article and this I believed at that time could not be possible even if I myself was sure I was correct. I had analyzed and calculated so much concerning this situation that I easily understood that the result could not be correct and could also easily give a suitable counterexample. I also understood why, namely that they had just moved the crucial singularity to another point. I informed my supervisor and we together improved my formulations and calculations to a full article. I still remember how proud I was when I was holding a preprint of this my first article in my hand.

• **6. What have been your research interests?**

★ My first research interest was in Harmonic Analysis. More exactly, in my PhD thesis I dealt with some questions about absolute convergence of Fourier series. This early interest has later on been developed to related questions concerning Fourier multipliers, wavelets, Gabor theory and also some corresponding applications in signal processing and image analysis. Moreover, it turned out that the techniques I developed in my PhD thesis could be used also to describe Lorentz spaces in terms of Orlicz space type and, as was first pointed out to me by Jaak Peetre, it could very well be possible that this technique also could be used to solve some open problems concerning descriptions of real interpolation spaces in some "difficult" off-diagonal cases. This fact motivated me to spend a lot of energy to learn also Interpolation Theory and finally I could in fact solve this question raised to me by Peetre. This was also the starting point of my research in Function Spaces and related questions, which always has been a great interest for me. But in all these investigations Inequalities have been of big importance and it was natural that I step by step became increasingly interested in this subject as a research subject in itself. Another main research interest today is Homogenization Theory with various applications in material science and tribology. It is maybe surprising for many readers that I also have some publications in *Journals in Mathematical Didactics* and also some PhD students in this subject. My publications here are connected to my tight interest also in theoretical questions concerning both supervision and teaching.

• **7. What about your collaborators?**

★ I have been very lucky to have many wonderful collaborators, who have influenced me a lot. At the moment I have joint publications with 142 different mathematicians from 37 different countries. Many collaborators have been extremely important for me both as human beings and professionally as mathematicians (the authors of this article, Professors Lech Maligranda and Mohammad Sal Moslehian, are two examples of such important collaborators). Of course it is impossible to describe all details here but I think that no one of my younger collaborators protest if I particularly pronounce the importance of the following senior co-authors: Jaak Peetre (Interpolation Theory, Inequalities), Jacques-Louis Lions

(Homogenization Theory, Interpolation Theory) and Alois Kufner (Inequalities, Function Spaces).



Photo 3 (left): Maligranda (left) and LEP (right) 2003, Poland.

Photo 4 (right): LEP (left) and Moslehian (right) 2008, Croatia.

● **8. What about your PhD students?**

★ I have been supervisor of 41 students, which have finished their PhD exams and another 13 have finished their Licentiate exams under my supervision.

Remark: Licentiate degree in the Swedish system is usually finished after 2,5 years after Master Degree and is sometimes used as a natural step towards the PhD degree, which usually takes 5 years.

Five of my students with PhD have so far been appointed as full Professors and more than 25 as Associate Professors. Moreover, some are working on development departments in the industry in Sweden and Norway. It is also worth to be mentioned that at the moment these students work in eight different countries.

● **9. What is the most pleasant aspect of your professional life?**

★ Just that I got this chance in my life. To work professionally and in full time with the most wonderful and beautiful subject which ever has been created in the history, namely mathematics. I remember when I as young PhD student dreamt about the possibility to later on get a possibility to work on some position related to mathematics. My dream was fulfilled and more than that. I have always been a lucky man mostly because of that and also because of all wonderful and creative collaborators and students I have met during these years. In particular, I want to pronounce that I not only like but also love to supervise PhD students. I am indeed very happy and proud that I got this unique opportunity to be a professional mathematician. Really wonderful.



Photo 5. 16 October 2006. Defence of PhD by Christopher A. Okpoti.
From the left: V.D. Stepanov, S. Barza, LEP, C.A. Okpoti, A. Kufner, J. Bergh.

• **10. What are your honors and awards?**

★ Without any comparison, the most prestigious award I have got is "*Ångpanneföreningens award*" from 2008 (100 000 SEK).

Background: Each university and university college in Sweden can nominate one researcher in all subjects to be the one who is the best to transfer important knowledge from the university to the world outside. I was nominated 2008 by my university and I was of course very surprised and proud of that. But it came almost as "a flash from the blue sky" that I in fact was the winner in all of Sweden. And I am of course the only mathematician in Sweden, who has got this award.

The most prestigious honor I have got is that I was elected as the President of Swedish Mathematical Society in the period 1996 - 1998, and before that I was vice President in 1994 -1996. I have also got the following honors and awards:

- In 1995-2002 I was elected as Secretary of the Swedish National Committee of Mathematics at the Swedish Royal Academy of Sciences. I am still ordinary member of the same committee.
- In 2000 I was appointed as permanent guest Professor at Uppsala University in Sweden.
- In 2002 I got the first "Louise Petréns award" from the network "female and mathematics in Sweden" for my special support to female mathematicians.

Background: There are extremely few female mathematicians in Sweden. One main motivation that I got the award was that I have substantially contributed to change this, e.g. I have myself supervised 17 female mathematicians to their PhD exams. No other mathematician in Sweden has been close to that. I was the first one who got this award and I am still the only male person who has got it.

- In 2003 I got the Orlicz medal for my contributions in mathematical research.
- In 2004 I received Sammy Lindmark's award (50 000 SEK) as the best researcher at Luleå University of Technology. I am the only mathematician who has got this award.
- In 2005 I was appointed as honorary Professor at Eurasian National University in Astana, Kazakhstan.
- In 2005 I received the Luleå University of Technology award (40 000 SEK) for my outstanding research of importance for the world outside the university.
- In 2007 I was appointed as ordinary member in the Committee of Mathematics at the Swedish Research Council, which decides about the money for basic research at the Swedish universities. Moreover, in 2009 I was appointed as chairman for the same committee.
- In 2008 I received student's award (10 000 SEK) as the best supervisor in all subjects at Luleå University of Technology. I was the first one who got also this award.

• **11. What is your priority: Teaching or Research?**

★ This is completely impossible for me to say. It is almost to have priority for one of the sides of the same coin. As you see from my descriptions about my honors and awards above I have been very heavily involved in both Teaching and Research and also to find ways to transfer this knowledge not only to students and other researchers but also to the world outside the university. And typically enough, the task I really like most of all is to supervise young gifted PhD students. Here I feel that I can reach my full capacity both in Research, Teaching and also my nowadays fairly deep knowledge and experience to handle also various situations, expected and sometimes very unexpected, which can happen in a young person's life during five years of intensive studies and related things in life.

• **12. How do you choose things to work on?**

★ In the beginning I was very narrow in my choices. I mainly worked only with similar problems as those in my PhD thesis and later on in Interpolation Theory. But this has changed and developed a lot during all my life (cf. point 6. above). This development has been very much influenced by all wonderful collaborators I have had (cf. point 7 above) and also by my attempts to find reasonable and interesting problems for all my PhD and Master students (cf. point 8 above). Nowadays I have the feeling that I can choose among a great number of interesting problems to work with and it is not easy to describe exactly how I choose in each situation among all these possibilities. I only want to say that one important criterion is definitely that the problem shall be really challenging for both me and my students and/or collaborators. Another criterion for me is that I can classify the problem as "beautiful" in the sense I believe Hardy meant by this

term. Sometimes I am also very excited to solve problems of technical importance by using mainly mathematical techniques and ideas.

• **13. Could you tell us how you work and how you arrive at new ideas?**

★ In the beginning I worked mostly alone and I was correspondingly more limited to find new ideas and possibilities. This has developed a lot so nowadays I have a big network of collaborators (cf. point 7 above) and this helps me a lot to find new challenging ideas. This also means that nowadays almost all of my papers are written jointly with other researchers. I also want to pronounce that I spend a lot of energy to find good problems for each of my PhD students, in which they are very interested and about which I have such information that they can be reasonable to solve in a suitable way. My large international network of collaborators is of course also very useful for my PhD students and give them additional possibilities to pose and solve various kinds of problems. I think that these facts are crucial for my PhD students to be so successful so far.

I also want for the first time to announce something maybe surprising. Many of my really best own ideas I have found during my long distance skiing (see point 22 below). This is a wonderful situation, you are in extremely good mode, nobody disturbs you during hours and you, only you, can choose what to think on. A perfect situation to find new ideas also in mathematics and this is exactly what has happened for me many times.

• **14. Many people think mathematics is a difficult subject. Is mathematics really difficult?**

★ This is an important question, which can not be answered in an easy way. I agree that this is the picture many people have concerning mathematics. Some even say that they are frightened of the subject, partly because they have not understood at school and correspondingly not succeeded so well. I want to change this and instead of saying that mathematics is just "difficult" say that mathematics is the most beautiful, creative and wonderful subject which has ever been created in the history. And that we all teachers and others must do our best so that each human being get the possibility to learn and enjoy this wonderful subject on a level and in a way which is possible for this individual. I have many ideas how this can be realized (see e.g. my hints on point 20 below) and I am myself ready to work for this until the end of my life.

• **15. What is your opinion about the duality between pure and applied mathematics?**

★ For me mathematics is the main subject in the history of human beings and this is a leading star for me also when answering this important question. I mean that you have infinite many ways to develop this diamond of science and

correspondingly to raise infinite many new open questions. One very challenging way to raise questions is to look at real world problems and formulate them in mathematical terms. I have done this myself many times and around 10 of my students (out of 41) have finalized their PhD's in mathematics with mathematical problems inspired in this way, mostly from material sciences, signal processing and tribology. I myself have also contributed as coauthor of some articles of this type which are published in Engineering Journals. Moreover, I have been Director of Center of Applied Mathematics at Luleå University of Technology for many years and the two last years also Director of Center of Interdisciplinary Mathematics at Uppsala university. My main opinion in this connection after a long experience is the following: Nothing can ever be so useful for solving real world problems as when you have been able to describe and solve them by using mathematical formulations and methods of proofs, sometimes combined with a number of simulations of typical cases and extreme cases.

In this connection I want to pronounce that I have developed a PhD course in applied mathematics for PhD students in other subjects than mathematics. This course has during the last 12 years been finalized by more than 500 PhD students, mostly from Uppsala University and Luleå University of Technology, from around 50 different research areas. The course is nowadays internet-based and easily available from my homepage and I know that it is extremely much downloaded all over the world.

• **16. Is Hardy true in saying that mathematics is a “young man’s game”?**

★ As everybody knows I really admire G.H. Hardy and his ideas very much. I have even been coauthor of two books and several articles with his name in the title. But here I do not agree with him even if I understand what he means. He means that the really outstanding results are usually proved by young people. But, in my opinion, mathematics is such an outstanding important subject that many of us, both young and old, can be very important for the further development in various ways. For example to write review articles, books and to supervise PhD students requires experience and broad knowledge during a longer period. Hence, I think that even we more senior people can be very important to hand over the existing experience and knowledge to the next generation. For example, I mean that I myself have never been so good supervisor as I am today. If we restrict mathematics to ONLY be “young man’s game” I mean that a lot of important things for our wonderful subject can be lost. Hence, I absolutely do not agree with Hardy on this point, at least with my own interpretation I have given above.

• **17. What is mathematics, in your opinion?**

★ Mathematics is the most fantastic subject, which ever has been created by human beings. A subject which has survived all trends and developments of new

areas of science. In many cases new results from mathematics have either been the direct reason or contributed in an essential way to such developments. This means in particular that mathematics is closely related to our culture, and several technological tools we nowadays use in a natural way are developed by using mathematical ideas and theories (e.g. Google search, modern fibre cables, credit cards, satellite signals, mobile phones, predictions of stock markets, predictions in the nature, pattern recognition, effective properties of composite materials, etc. etc.)

• **18. Why is mathematics effective and useful in explaining various kinds of phenomena?**

★ First I want to pronounce that mathematics is the language of engineers and, thus, that mathematics is the basic of all the technical development and how to communicate technical knowledge between different generations, countries, research areas and cultures. But, in my opinion, also this explanation for such a powerful "king of knowledge" is very narrow. I want to broaden this view by pronouncing that mathematics is the most creative, beautiful and wonderful subject which ever has been created and correspondingly deeply equipped with all types of developments in the history (see also point 17 above). By using this strength fully out in describing and developing various kinds of phenomena I believe that we can create a world which correspondingly will be more creative, beautiful and wonderful. To be "the engineers language" is just a limited part of this explanation.

• **19. What is your opinion about the future of electronic publications?**

★ This is a delicate question. I think it will be much more electronic journals in the future. Already today you must pay to publish in some of these journals. In my opinion, this can be very dangerous but difficult to change. I strongly mean that it shall only be the quality and interest of the paper, which are important for if a paper shall be published or not and not if the author or department can pay. But the tendency today is that the amount of journals with these page charges increases.

However, in general I am positive to electronic journals, which are easily available all over the world. This can be very important e.g. for researchers who have not good libraries. For example, in Ghana, which I visit all summers nowadays as a teacher in a summer school, this can be particularly important. In particular, I judge that the Banach J. Math. Anal. (BJMA) has a very good prognostic to be a splendid example of an electronic journal with great impact in the future.

• **20. How can we make mathematics more exciting for young students?**

★ This is one of my favorite questions. However, I can not give a complete answer here, but I can say that it was just my contributions in this connection which was the main argument why I got my most prestigious award (Ångpanneföreninges award 2008) described in point 10 above.

I mean that we must find new ways to get more students genuinely INTERESTED in the subject. I also mean that it is important to help the students to be SELF-CONFIDENT with the subject, to give more support and to show with concrete examples and illustrations how it works instead of just criticizing that they are wrong.

In the Swedish system we have a great problem at the moment, we know that something like a third of the lectures in mathematics on all levels of the basic school system are delivered by teachers which have not mathematics as one of the the main subjects in their education. If the teachers are not sufficiently interested, enthusiastic and with sufficient knowledge, it is difficult to submit what I want to the students. Correspondingly, I mean that a big change must be done in the recruitment, education and status of the school teachers.

In this connection I can mention that last year I was invited to a debate in the Swedish national television together with two representatives of the Swedish government. I hope that this debate has contributed to the fact that this spring the government in fact has decided to make fairly big changes concerning the teachers education in mathematics in the direction I have advocated above.

Another contribution I have done is that I have together with one of my PhD students produced an internet-based material with examples of interesting, exciting and beautiful mathematics, which directly can be used in classrooms on various levels. Also this material is easily available on my homepage but so far we have the material only in Swedish language.

• 21. If you hadn't become a mathematician what would you have done instead?

★ I think I could have been medical doctor, which was my original plan and my mother's dream. But it could also have been schoolteacher, which was the main plan when I started my studies at Umeå university (but was convinced by Ingemar Wik and others that first I should take PhD exam in mathematics). In this connection I must also confess that later on it has turned out that I have also a genuine interest to understand other people and their way of thinking, so maybe even psychologist could have been possible. I myself think that also this interest has been very important that I have so many coauthors and successfully been able to help so many students to their PhD exams.

• 22. What interests do you have except mathematics?

★ My main interest outside mathematics is my wonderful family. For example, my wife Lena accompany me on many conferences and we usually also spend some additional time for some tourist excursion in connection to that. I have also

always been very interested in sport. For example, I have been active football player and participated in many orienteering competitions and 19 full Marathon runs (with best time 2.49). But my main sport is skiing, where I still participate. For example, I have finished 37 Vasa runs (the famous ski competition of 90 km. between Sälen and Mora in the middle of Sweden) the first Sunday in March each year and also 13 "open tracks" (a competition in the same track Sunday/Monday the week before). Totally 50 Vasa runs/open tracks. I have participated in all three competitions the same year five times (including this year) and it is very few who has done that and I am definitely the only one in my age. My best time in Vasa run is 4.56 from 1983.

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