

Interview with Marta Sanz-Solé President of the European Mathematical Society

Interviewer: Carles Broto (Bellaterra)

Carles Broto: *When did you become interested in the activities of the EMS and what made you think of the possibility of being President of the Society?*

MARTA SANZ-SOLÉ: It all happened quite unexpectedly. This was in 1995. An active member of the Society told me that there would be vacancies at the Executive Committee and proposed me to stand for election. After some thinking, I decided to run. I was elected by the Council in 1996 and stayed at the Executive Committee during the period 1997–2004, after a re-election for a second term. During this period, I got a fairly deep knowledge of the Society. I was privileged to work with three past-presidents, Jean-Pierre Bourguignon, Rolf Jeltsch, and John Kingman. Being aware of the size and complexity of their tasks in their respective roles as presidents, I couldn't ever imagine that I would become involved in the Society at the highest level.

In the year 2009, my predecessor, Professor Ari Laptev, asked me to consider the possibility of standing for election of President. As far as I know, this was after consultation with previous presidents and with the consensus of the Executive Committee. I thought about it deeply and carefully. I was aware of the consequences that taking this position would have in my professional and personal life. Eventually, I decided to go ahead. I feel thrilled and have great pleasure to serve the European mathematical community in this extremely interesting position.

The EMS was founded in Poland in 1990, the same country which now hosts the European Congress of Mathematics. How do you see the evolution of the EMS throughout these 22 years?

It is like following the trajectory from a newly born creature until maturity. When the EMS was founded, there was essentially no structure. Thus, the very first task of the Executive Committee with its first President, Professor Friedrich Hirzebruch, consisted of building a structure: completing and developing the statutes, setting up committees, establishing alliances, etc. Now, twenty-two years later, the EMS possesses a solid structure, strong relationships with its members societies, with all its members, ten specific committees, a publishing house, etc. In short, a truly remarkable development.

What are the most positive aspects of the EMS and what should be changed or improved?

The EMS provides instruments for collaboration to mathematicians in Europe. This is done through various committees engaged in specific topics, in different aspects of the profession. We organize an annual meeting of presidents of societies to enhance interaction between different mathematical societies that are members of the EMS. The Society is acknowledged as an institution to be consulted for issues related to mathematics in Europe. For example, EMS is asked to suggest members of important European scientific policy boards. We propose members of prize committees, like the Abel Prize. The European Congresses of Mathematics (ECMs) have consolidated its status as a showcase of mathematics in Europe. These are some examples of very positive aspects and a proof that the Society has reached its adulthood.

I do not see the need for changes or drastic modifications, but there is certainly a lot of room for improvements. For example, I'm trying to provide the Society with a more professional structure. We have a good secretarial basis, but otherwise most of the work relies on volunteer work. Having a larger professional structure would result in more stability and continuity of the projects we are developing. We are working towards improving our support to scientific activities. We would like to publish open calls for a series of scientific activities and to try get some of them sponsored. At present, we receive quite a lot of proposals and after a careful analysis, we decide whether or not we provide our support. However, it seems to me that this is a little unfair because there is no open competition. We want to increase the involvement of delegates at the Council in the life of the Society.

The Council meets every second year. Delegates have some clear activity around the Council date but afterwards, activity vanishes. We should find an appropriate way to incorporate delegates in the everyday life of the Society. These are among some of the aspects that should be improved.

What are your main goals as President of the EMS?

This is a hard question! Let me see... I will distinguish between the very concrete and the more abstract ones.

As for the concrete, I guess a recurrent goal of a society is to increase the number of its members. This is not only for financial reasons, but because this implies more recognition, more support, and an extension of its area of influence. The second is to enlarge the network of cooperation with other scientific societies in disciplines that are related to mathematics. For example, computer science, mathematical physics, and also statistics that has a theoretical mathematical part but also a more experimental one.

It is also one of my goals to increase the visibility of the Society. We should make every possible effort in advertising what the EMS is doing for mathematics in Europe. We mathematicians are traditionally not very good in publicizing and advertising. I wish we could develop instruments to help mathematicians to find a job. And when I say to find a job, I mean to start a career as researchers and/or teachers. This may consist for instance in creating a database of vacancies at the European level, with post-doc positions available, etc. There are a few initiatives in different European countries, but it would be great and very useful achievement to have an international database. We want to work on it.

Then, there is the recurrent problem of raising funds. The experience of the last years shows that except for individual grants (like the ERC grants and the Marie-Curie actions), EU funding instruments are not very well suited for fundamental research and for mathematics in particular. I would like to explore the possibility of having some of our projects funded by private foundations. It is worthy mentioning that there are some important foundations which support strongly fundamental research.

In a more abstract framework, there is an area where all EMS past-presidents have invested a lot of energy, but still there is a lot of to be done and to achieve. This is to increase our presence and influence in Brussels. This means for example to be present and to have our views be taken into account in the agencies, offices and corridors where the crucial decisions

on financing structures and instruments for the future are discussed and final decisions are made. There is a long way to run. Nevertheless, we have progressed quite a lot. This objective has a strong political component and although quite abstract, the consequences could be extremely concrete.

What is nowadays the place of mathematics within the general society in Europe?

When you say general society, do you mean the scientific community or rather the society in general?

I mean the general public.

In the recent years, say the last 10 or 12 years, mathematics has experienced and incredible impetus. Probably, the Mathematics Year 2000 boosted such an expansion and a new perception. I believe that mathematics is nowadays much better known and acknowledged by the general society. I am talking about society with a good cultural level rather than about the layman.

There is still the perception that mathematicians are very introverted people, a bit mad. Nevertheless, I also feel a lot of respect, admiration and understanding. Last year, when I was elected President, I had many interviews on the radio and on the television in Spain. All journalists were fascinated about what I was telling. They concluded unanimously by saying that there should be more interviews to mathematicians, that our subject is really amazing, beautiful and useful; much more than people could ever imagine! I was delighted and surprised. I think we're in good time.

Should we try to increase the recognition of mathematics among the general public, or even among other scientists? What is the role of the EMS at this aim?

Obviously this is something we cannot elude. As for recognition by other scientists, I find it extremely important because for me, mathematics should develop finding a good balance between creating mathematical knowledge and finding applications and interactions. Interaction of mathematics with other disciplines has increased enormously. For example, with biology, with economics in the analysis of financial markets. And yes, we should do every possible effort not only to maintain the actual level of recognition but even to increase it. The EMS is very active in popularizing mathematics to the general public and specifically to young people, to increase their attraction

to the discipline. Actually, this is one of the main objectives of the committee *Raising Public Awareness of Mathematics* (up to now, the only committee supported by a private foundation) with an extremely satisfactory activity.

How could other institutions or individuals contribute to the dissemination of mathematics?

This is another aspect of the a question you asked me before.

Talking about individuals, a change of attitude will already be a great improvement. Many mathematicians are not very enthusiastic to communicate what they are doing. I think a change of attitude would obviously help.

And the same applies to institutions. The attitude of institutions is not uniform, some are very open, others are closed and archaic. In most of the universities of my country the structure is based on thematic departments. This is not very suitable for promoting dissemination and collaboration. There are very few collaborations between different departments. In other universities, like yours, with a unique Mathematics Department, the situation is different. It seems to me that to better disseminate our findings, we need a change of attitude and an *aggiornamento* of structures.

Do you think that today, the society and in particular the mathematical society has overcome the difficulties that women have encountered in the past?

Well, I have excellent news! Right now, four of the largest mathematical societies or with a strong mathematical component have a woman as President.

I do not know if this is really significant...

I think it is. It is significant that women have achieved this high level positions and that they can represent and lead a large community.

As you know, the president of the IMU is Ingrid Daubechies. The president of the Institute of Mathematical Statistics is Ruth J. Williams and the new President of SIAM is Irena Fonseca.. If we continue this trend, the standing committees for *women in mathematics* would need to be changed into committees for *men in mathematics*! Allow me for this joke.

Obviously, there are barriers, strong and objective barriers. But they depend very much on the societies, on countries. In most of the European

countries, I do not think there are objective barriers for women to develop a profession, while in other countries of the world, this is not accepted and there is a serious gender discrimination.

Anyway, I do not consider this problem as something specific of mathematics. The difficulties for women to access to highly ranked positions also occurs in many technological fields, and in financial institutions as well. This happens less in politics for instance. In other scientific areas, such as biology or education, the situation is opposite.

Rather than to put the stress on external barriers, I believe that female idiosyncrasy has a significant role. Let me tell why. From my own experience and from what I observe, we women are in general much more versatile and feel interested in a diversity of objectives. In contrast, women are usually less ambitious. There are neurological theories explaining these facts. If you focus on one single goal, you have high chances to succeed; if you scattered your efforts through several objectives, you may loose efficiency and be less successful. There is also another psychological aspect. Women feel more attracted to work in teams, to collaborate. In a field as abstract as mathematics collaboration is not essential. We know that one can be quite isolated and nevertheless produce high quality mathematics. We have very clear examples of very talented people, right? However, I do not think it would have been possible to get something like in vitro conception, or things like that, based on the idea and work of a single person.

What is the role, the main objectives, of the ECMs?

The main role is to keep the unity of mathematics. Also, to provide mathematicians, with a forum for interaction and discussion of topics of interest for their profession of mathematician. The basic component is, of course, research. But there is also the possibility to discuss related issues, such as publications, the integration of women in the profession (we talked about this before), international cooperation, etc.

As for the objectives, one is to have a kind of trade fair, to show what are the trends in mathematics and what are the mainstream research topics, that is, what are the lines that are currently driving and motivating mathematical research in different areas. A second goal is to provide a showcase for mathematics in Europe. Many outstanding mathematics are

being done in Europe and Europe has an identity. It is very important not to lose the opportunity to show a representative sample of what is going on in our discipline. The third objective is to recognise excellence. This is accomplished through the EMS Prizes, something we are very proud of. We have consolidated the ten EMS Prizes to young people up to 35 years, the Felix Klein Prize for applications of mathematics in industry, and this year we will award the newly created Otto Neugebauer Prize in the History of Mathematics.

Why an individual mathematician, extremely busy with his or her own research problems, should take a break and attend a congress like the ECM?

As I have said before, one can carry out mathematical research in a very closed and reduced environment. But in my opinion, these are not optimal conditions. Having the possibility to interact and to receive the influence of colleagues working in areas related or primarily unrelated with our own fields of interest is definitely very enriching. I have no doubt about it. Listening to speakers from different areas of mathematics helps to nurture our own research activity and to broaden its horizon.

Probably various publishers will be present at the ECM, some related to scientific institutions and other private. What should be the role for them in the objectives of the congress? What role do they play in the advancement and dissemination of mathematics?

Publishers belonging to scientific societies play a crucial role, because they are closer to the mathematical community than commercial publishers. They can offer much more affordable prices since they are non-profit organizations. With such practices, the community feels that scientific societies are concerned about this very important problem and that they put efforts to provide good solutions. However, there is yet a lot to be improved. Clearly, the visibility and presence of these publishers is small in comparison with commercial. But non-profit publishers could create alliances and offer, as commercial publishers do, packages of journals and books. Then, they could become much more stronger.

On the other hand, some commercial publishers have been doing a great service to mathematics since many many years. One cannot ignore this, and one cannot ignore either that there are many important and delicate issues where co-operation with them is crucial and absolutely necessary.

Hopefully, discussions about publications will take place at the Congress. Publishers present there would be able to get a direct impression of what are the main concerns of the mathematical community.

How do you compare the ECM with the International Congress of Mathematicians?

They have similarities and differences. An obvious difference is the size. More or less, an ICM is four times an ECM. This is in terms of attendance, but in terms of programme it is much more than four times. At ICMs, there are many speakers in a variety of subjects. There might be about twelve or thirteen in number theory, to mention an example.

In comparison with ICMs, ECMs have a much more flexible structure. The former have a catalog of areas that change very little from one congress to the next one, and speakers are classified according to this strict catalogue. In the case of ECMs this is very different. A scientific committee is appointed and selects the speakers trying to get a balance within fields. But there are neither rigid boxes nor fixed numbers. This allows flexibility and quite substantial changes at each ECM. It might happen that an ECM is a bit biased towards certain fields, and that in the next one, bias changes its direction completely. I feel this flexibility very positive.

Another difference is that the open participation at the ECMs is very restricted. One can see this as an advantage or as a disadvantage. As you know, at ICMs almost all short communications submitted by participants are accepted. This results in an open and large participation. However, sometimes short communication sessions have very low attendance. Some are very good, but some are really at the borderline of what would be acceptable. At the ECMs open participation is possible through posters, but any other scientific activity is by invitation only, and decided by the scientific committee. I think these are the most important differences.

What is the future of the ECMs?

I expect a prosperous future and a long life. However, they might be affected by some serious problems. I am referring specifically to the current financial crisis. For example, we have received extremely good pre-bids for the next Congress, but some of them were pulled back due to financial difficulties.

What are your expectations concerning the congress in Kraków?

This will be a memorable conference. There is no doubt about it. The scientific programme is very appealing and the Polish colleagues are doing great efforts to set up the best possible conditions to make our stay an unforgettable experience. Kraków is a marvellous city and this is also a good (secondary) reason to participate at the 6 ECM.

When did you discover your vocation for mathematics and what pushed you into your academic career?

I do not remember feeling a vocation, when I was very young. I felt attraction to the subject and I was quite successful in solving problems. The strongest attraction came when I was at the high-school. I had really a lot of fun with mathematics there, and I was very much motivated by abstract thinking and by scientific theories. I met some excellent teachers who encouraged me to consider studying mathematics at the University.

When I finished my undergraduate, I had to think quite seriously on my future. At that time, there were essentially two possibilities to embark in the profession. Either to prepare and to pass special exams to become a high school teacher or to obtain an assistant position at the University and to do a PhD. The second choice got my preferences. On one hand, I felt challenged by doing research, by proving new results, something I had never experienced yet. On the other hand, I also thought that this option was less restrictive and that if I ever changed my mind it was easier to re-orientate.

What are the main topics that you are interested in?

My research interests lay in stochastic processes and more specifically, on stochastic analysis. Particularly, in stochastic partial differential and differential equations.

Among your results, is there a single one that you like the most? Why? the difficulty in getting it, the influence in further work...

I have my preferences indeed. I like some results for what they prove, for what they represent as contribution to the field. I like others for the memorable experience in conceiving and proving them. The two sets are not disjoint of course. Let me talk about quite old papers in the latter group. I would like to mention the characterization of the topological support of the law of random fields. With my colleague Annie Millet, we gave a very

satisfactory answer for a stochastic hyperbolic equation, a problem that was tackled unsuccessfully by some people. Later on, jointly with Annie and Vlad Bally, we studied the same question for a stochastic heat equation. In both cases, I remember very clearly the lightning, the magic instant of *creation*. Now, some years later when we evoke with Annie and Vlad memories of our extraordinary cooperation we still feel great happiness.

I am also proud of a joint quite influential paper with Annie Millet on existence and properties of the density for a two-dimensional stochastic wave equation. As far as I know, this was the first time that Malliavin Calculus was applied in a rather new framework.

Throughout your career you've probably had several contacts with research institutes and Polish mathematicians, what is your opinion of mathematics in Poland in general?

It is a fact that Poles have a long standing tradition in mathematics, with outstanding and extremely influential mathematicians, people that boosted and developed whole subjects, like Stefan Banach to mention just one. The tradition continues. One find in Poland and around the World great Polish mathematicians. Moreover, Poland has an excellent research centre, the Banach Center, with very convenient facilities in Warsaw and in the conference centre in Będlewo. The Banach Center has played an instrumental role in bringing together mathematicians of very many origins in times where crossing borders was a challenge. At present, it is one of the members of the EMS research institutes network ERCOM.

How do you live the interplay between teaching and research at the University?

We could talk many hours about this. I have really enjoyed teaching at the early stage of my academic career, and I am still enjoying it. In my opinion, having a deep insight on the subject you teach is indispensable. Of course, one can make an experiment with a subject which does not really fit in your research interest and still give a good course, but I do not think this is very frequent. And I would say this is quite rare at the postgraduate level. So, for me there is a strong relationship between research and teaching. They nurture each other.

When becoming more senior, our professional activity gets much more multitask. As a scientist, you are invited to sit in different type of boards, to contribute to editorial activities, to be involved in collective work, etc. It is

tough to combine properly all these activities. Then, teaching may become a burden. I think that universities should be more sensitive to this problem than they usually are.

I am myself in this situation right now. Nevertheless, I still like to keep connection with students mainly at the master level.

You have been focused on teaching at undergraduate and masters levels. What can you say about a PhD?

Training for research is a completely different activity than developing a syllabus. The role of an advisor is a very difficult one, and entails high responsibility. Firstly, there is the choice of a good, timely and feasible topic for the thesis. For somebody active in research this is not the hardest part. Although, we are well aware that surprises may occur. But then, there is a need to find a good balance between student's initiative and advisor's involvement. Advisors should help PhD students to find their scientific independence. Don't you think there are many analogies between this task and bringing up children?

Do your duties as President of the EMS take much time from your own research and teaching?

Yes, definitely. The task of a President can be a nonstop one. Of course, you can establish your own limits and plan objectives accordingly. However there are also facts, problems that appear suddenly and that go beyond your planing and control. Currently, I devote more than 50% of my time to the EMS. Part of it consists of traveling (something tiring and time consuming). Another important part is office work, thinking, planning, writing, and lot of interactive e-mailing. Obviously, this has consequences in other aspects of my life. Fortunately, so far I have benefited from a 50% reduction in teaching. I am very grateful to the University of Barcelona and the Institute of Catalan Studies for it and I very much hope that the deal will continue until the end of my office.

Regarding research, I try to continue to be active, less intensively though. Doing research is a very enjoyable part of my activity and I do not want to stop. Because of my role as President of the EMS, I feel myself in a curious situation. Many times, when I am attending meetings related with the EMS, I am also invited to give lectures in mathematics colloquia and seminars. This is an additional motivation to maintain my research activity, although

it entails extra work! Anyway, I am proud and thankful for these type of invitations.

And from other hobbies? Do you still have time to play the piano?

I have very few time left. But yes, I scape from maths from time to time. This is not only to maintain a sound psychological balance, but just for my pleasure. My hobbies are quite intellectual. For example, I love modern architecture and when looking at a building, I challenge myself to understand the connections between technology and art in that particular example. I like to walk, stop at a place and abandon myself to contemplation. I love to observe people, their faces, their attitudes, their expressions...Perhaps this is also related with my interest in photography. I enjoy taking photos a lot although I am not at all and expert. I enjoy visiting photography exhibitions, and art exhibitions in general. Then, there is music. I love music, opera and concerts. If for whatever reason I visit a city with a famous concert hall or opera house, I try not to miss a performance there.

Oh, the piano is nowadays rather left apart. But seeing the keyboard gives me a lot of energy. Perhaps, when I will retire, I will take courses again. I play occasionally but being a bit of a perfectionist and shy, when I listen to myself, I say wouldn't it better to stop? Most of the times, I keep playing...I enjoy it very much.

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