

Prof. G. Stock

Balzan Prizewinners' Interdisciplinary Forum

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– Keynote Speech on the topic

“Academies and Foundations to Promote Excellent & Independent Research” –

Distinguished winners of the Balzan Prizes,

Dear Professor Curzio,

Ladies and gentlemen,

Prestigious prizes like the Balzan Prize and public award ceremonies are a great opportunity for scientists, for the science system itself and of course for institutions and in most cases for foundations as well to show and present their work. And there are several reasons why science, the science system and scientists benefit from prizes:

1° First, prizes clearly show to the non-scientific world the necessity for and, even more so, the abundance of excellence.

2° Within the science and research system, prizes send a clear signal that excellence counts and that the decisions of the jury are carefully observed by their peers, and hence they are part of the quality assurance practice within science.

3° And finally, since the prizes of course are given to personalities but are surely not independent of the topic they have been working on, the decisions of the jury can also be a hint about trends in science at that point in time.

For foundations, the awarding of prizes is a perfect opportunity to document their principles and to demonstrate their missions. Moreover, it is a wonderful signal that civil society cares about our future and hence cares about science. And there is no doubt that science, the science system and we, all scientists, need the support of non-governmental foundations, a support which of course goes far beyond donating prizes.

In order to talk about the role of foundations and academies within the frame of our science and research system, we first need to begin with a few general remarks on science and our current system.

There is no doubt that the world we are living in is a so-called “*Leonardo world*”, a term created by Jürgen Mittelstraß, a German philosopher who indicates with these semantics that we people, scientists, and engineers largely contributed to what is surrounding us, I mean to our world as it is.

There is again no doubt that the challenge, the responsibility to further improve the “*conditio humana*” and hence to tackle all the challenges ahead of us, be it climate, be it energy, be it health, can only be tackled by science, by better science and most likely by more science. However, science must be interconnected and truly problem-oriented, since the problems we are facing are not disciplinary problems only.

The great challenges don't care about disciplinary functions and borders. And one of the major challenges within science has been and is to grasp these complexities with interdisciplinary or, again as Mittelstraß would put it, with trans-disciplinary approaches.

Universal geniuses like the founder of my academy, Gottfried Wilhelm Leibniz, or Isaac Newton, founder of the Royal Society in London, or even Leonardo, are no longer available or possible. Therefore, we have learned to organise science, especially of course but not only the field of big science, into consortia and in many cases into regional and, where appropriate, into supra-national or even globally acting teams. And yes, this has led to an interdisciplinary working attitude, which however in most cases is still an interdisciplinary philosophy within natural sciences, including engineering.

Bridging the gap with humanities and social sciences is still a major effort which we have to make since, as I mentioned before, most of the big challenges are still ahead of us. And the challenges need reflection, a true risk-benefit analysis which goes beyond technology and economics. Therefore, I would like to mark this true interdisciplinarity as the first of a number of “*desiderata*” we still have in science and within the science system.

There is no doubt that the way we have approached our problems both in the past and present has been and still is highly successful; the scientific achievements in our various disciplines are breathtaking. This is true for e.g. medicine, where I come from, where we have begun to understand diseases at a molecular level and also treat them at this level. Another example of our enormous scientific success during the last decades is the field of space research, where scientists have managed to land a satellite called “*Philae*” after a 10-year journey on a small comet with the size of 12 square kilometers.

Of course, there are many more examples in all fields. All of these achievements have a direct impact on our daily life, but they also increase the expectations people have of science and the desire of those who, by profession, have to care about science – to be specific, not only scientists, but also politicians and managers.

The successes increase their desire for new solutions for solving the challenges ahead of us, and of course decision makers want to direct the money which is spent on research more and more towards those areas which promise new products, new processes and new solutions. This is what we call product-oriented or applied research.

It is less and less understood that there is a continuum between curiosity-driven research and applied research. Curiosity-driven research is the beginning and the humus of all. Without this type of research, the ensuing applied research will soon die out. And it is also true that there is no clear sequential order between curiosity-driven and applied research. However, we know much better today that there is an interactive relationship between these two.

Some curiosity-driven research has an immediate impact on applied research, but sometimes it takes 15 or 20 years to obtain results in applied research as it for example happened in what we call biotechnology today. There, it took from the late forties and fifties to the eighties and nineties to create a new industry out of the early research efforts. Sometimes questions arising in applied research necessitate completely new approaches to thinking and experimenting, and sometimes one has to go back to very elementary and basic questions in order to overcome hurdles and solve applied research questions. This even has consequences in the organisation of science and in our innovation system. University research which used to be curiosity-driven research today sees the new necessity of looking into applied research as well. And industry, the classic locus for applied research, in many cases faces an enormous need for curiosity-driven research within industry, often with the help of networks including academia.

So, the relationship between invention and innovation, with innovation being the practical outcome of what has been created before as invention, is highly complex. And there can be no innovation without invention, because in most cases breakthroughs are made in curiosity-driven research. So I would like to state that my second desideratum is the need for curiosity-driven research which must not be scaled down – in contrast, we need more of this kind of research.

In this context, we have to learn a third lesson: research in the humanities and in the social sciences is not only needed to preserve our cultural heritage. It is not only needed to interpret this heritage and make it available for our current thinking. It is also needed because, in the words of the German philosopher Hans-Georg Gadamer, *“Zukunft braucht Herkunft”*, or if you would like to put it in English: *“If you want to prepare for the future, you need to know where you come from”*.

The hype about news in natural science or engineering and the excitement which it creates should never make us negate this basic principle – the need to support research in the humanities and the social sciences. And nevertheless, it took more than two years to make the

Commission in Brussels who elaborated *Horizon 2020*, the new framework programme for research in Europe, to understand that humanities and social sciences are not only helpers and, to put it negatively, 'reflection machines' of the developments of the natural and technical sciences, because these fields have their own research needs in basic, curiosity-driven research.

We know of many countries and not only poorer ones that are cutting the expenses for humanities and social sciences. And this is done in times when, more than ever, we need true interdisciplinarity, which means that not only mathematicians, engineers and material sciences work together but also philosophers, sociologists and others.

The big challenges ahead of us demand and need the work of the social sciences and humanities, disciplines that take part in the dialogue on the best possible way to the future and, from the beginning, add their competencies to the large transformation processes which are a characteristic of our time.

The old traditions which are sometimes pursued to find technical solutions and then, some time later, even years later, used to reflect on consequences for our societies, represent an attitude and sequence which no longer work. Large technical programmes need intensive parallel reflections with ethics, philosophy, law, sociology and other disciplines. And of course there are more massive transformation processes ongoing in our societies, such as migration, religious diversity and many others which need research and new concepts.

So my next topic in my list of "desiderata" is the preservation of the roots of innovation: curiosity-driven research including the humanities and social sciences. And this new development within science is paralleled by new ways of communication. Within science we now have a massive movement called "open access" where the role of publishers and science journals is questioned or threatened, or as you can also say in a positive way, supplemented by pre-publications and publications on the internet and in social media with blogs and tweets, which are used to distribute scientific results.

Especially social media are used to increase the awareness for scientific results, and Wikipedia, with its enormous amounts of data and information and sometimes even knowledge, gives all of us the impression not only of rapid and easy access to what the world knows, but almost kindles the feeling that the availability of scientific data is identical to a solid knowledge of and the ability to properly reflect and interpret the data and bring them into context. But this is by no means sufficient for enabling and improving judgment!

A couple of years ago, we had a very simple communication system: the scientist on the one side published his data and his interpretation in peer reviewed journals and if the data were of some interest to the public, science writers in journals on the other side were there to translate it to the public. Only rarely did scientists directly address the public; this attitude

was even judged as being non-scientific and the scientists were regarded as being not as serious as they should be. Only the most successful were still somehow appreciated by their peers.

Things have changed completely. On top of this and as a consequence, data linked to science, being positive or negative, are in most cases not reported by science writers but are first reported by general journalists. And the first reports, as we know, set in most cases the tone and the trend as to how the topic would be discussed in the media from that point onwards. When science writers and scientists, especially in cases where negative events are reported, start to discuss and to reflect on what has happened, the first hype has faded and the interest of the general public has already turned to the next topic. So the next challenge we are facing is to prepare our scientists for this new world of communication, be it scientific communication or be it communication with the general public.

And there are many other challenges for scientists and for the science system which should be discussed, but I myself will concentrate now on my last and final point and this is the education of our young generation. It is general knowledge but not yet on the political agenda that the number of young people who are studying natural sciences – in Germany we call it “MINT” (mathematics, informatics, natural sciences and technology), called “STEM” in the Anglo-Saxon world and standing for science, technology, engineering and mathematics – is getting smaller and smaller. This is true for many countries in which today almost half of the young generation is entering university.

The desperate need of our science-based society for trained and educated young people especially in the fields of “MINT” or “STEM” has now become an important economic factor. And in this situation, scientists as well as scientific organisations have to think and act carefully in order to find ways to increase the desire of young people to go into these fields and to stay there, especially in engineering, where a high amount of beginners – after some time – leave their studies and do something else. Thus, motivating and retaining the talents is an important aspect we have to deal with. At the same time, we also need a fresh look at how to improve the skills of students in the fields of humanities and social sciences. Here, I feel, a major issue is not the number of students but rather their attitudes, their preparedness to cope with the new challenges in their disciplines.

Ladies and gentlemen, I think with this array of needs and future needs I have now somewhat prepared the floor for the discussion on what academies and foundations can contribute within the focus I have chosen. As president of ALLEA, I ask for your understanding that I first start with academies and the role they can and should play in the context I have discussed.

Academies, if I start with the old Greek academies of the Platonic type in the 4th century before Christ, were places where the independent and undistorted search for the truth could take place. They were places where individuals could follow this mission in a secure and trusted surrounding. This idea and principle was somehow forgotten until the times of the Renaissance and Enlightenment at the beginning of the 18th Century, when this idea was rejuvenated. The Lincei Academy (founded in 1603), the Leopoldina, Germany's National Academy which is today located in Halle, the Royal Society in London, and the Académie des sciences in Paris were the first modern academies created in Europe where scientists, independent from courts, could do independent research. However, these academies only brought together the natural sciences and medicine. Gottfried Wilhelm Leibniz in fact was the first who felt that in order to improve the "*conditio humana*", one needs all sciences which should work together in order to combine "*theoria cum praxi*".

Leibniz did not place one discipline over the other, he wanted to have this combination and he already knew that careful deliberation is part of our scientific duties, before and during implementation of new ideas. A mission, ladies and gentlemen, that could not be better formulated in our today's world. Our host, the Lincei Academy, is in the same league. Academies and foundations have in common the autonomy to act and to preserve.

The autonomy of research and science is one of the great contributions that have altered and modernised the science system. Whilst the academies can provide a space where scientists can retreat and reflect on what they are doing, what they should be doing, where they can learn and train interdisciplinarity, where they can learn to understand the language being used in disciplines outside their own, and where they learn to understand and appreciate approaches being taken in other disciplines, foundations can, in a complementary way, also support scientists by offering them opportunities to retreat and to reflect in an interdisciplinary manner. And both academies and foundations can define new topics which can be dealt with by the scientists – topics which can be defined in workshops or congresses with a different level of publicity and also without publicity. This is a fantastic opportunity that foundations and academies can offer to scientists: to retreat and reflect. In many cases, this is also an opportunity for interdisciplinary work as the basis for what we call "scientific advice", both for the public and policy. The ability to take the different steps from information to knowledge and from knowledge to judgment is an opportunity often offered by academies and foundations in a similar way – an asset that is probably more important than ever.

Discussions in many foundations, but especially in the academies which are e.g. brought together in ALLEA – the European Federation of 58 academies in Europe – were instrumental in shaping *Horizon 2020* in Brussels, especially in creating a new awareness for curiosity-driven research, interdisciplinarity and offering a "*raison d'être*" for giving the humanities and

social sciences a special chapter within Horizon 2020, which was, as I mentioned before, heavily debated for a long time and as we all know is not over yet.

In Brussels, we still find people who try to minimise and sometimes trivialise the contributions of the humanities and social sciences towards coping with the challenges ahead of us and ahead of Europe. Without the help of foundations or private donors, as we recently also learned from our American colleagues, curiosity-driven research, especially in the humanities, would severely be hampered in the United States.

If I look at the work by my Academy in Berlin, the edition of Friedrich Nietzsche and the new editions of Immanuel Kant or Gottfried Wilhelm Leibniz would not be feasible without the generous donations of foundations – supplementary in my country to what the government is doing in an exceptional way.

How do we create new ideas and new initiatives in our sometimes rigid academic system, how do we bring in new ideas and help to make them part of the institution? In many cases, think tanks in academies and foundations can formulate new needs, and the advantage of foundations is that they can financially support and also sponsor or endow chair programmes. All this can be achieved, and is being achieved, by foundations.

There is one minor concern, however, that I would like to raise: sometimes I feel that in recent times foundations have started to formulate their own programmes more and more, and support only topics which fit into these programmes which, by nature, might be even narrower than their missions. And I would plead that foundations remain open to applications by scientists who are trying to follow ideas that are clearly far away from mainstream and are clearly risky.

Yes, I do appreciate that foundations already take more risks when funding as compared to governmental funding agencies, but this is exactly what I am asking for: maintaining this attitude towards sponsoring non-mainstream and therefore uncertain projects. This is where the scientific adventure is and where the borders of current knowledge are. And in the words of Francis Bacon, that means: *“As the birth of living creatures at first are ill-shapen, so are all innovations”*. This is where foundations can have the highest impact, not by filling gaps left by governmental systems but rather where we open up a new world, where science is, at its core, questioning existing knowledge, widening the horizon, crossing borders of disciplines and knowledge and truly exploring a completely new approach and perspective. This is where transdisciplinarity can start, where scientists have the energy and the courage to make themselves vulnerable by leaving the disciplinary safe harbours.

Training our young scientists as scholars in what we call “soft skills” is not part of the classic government-sponsored curricula. Here again, academies and foundations play a prime role

in enabling both our young and seasoned scientists to cope e.g. with the new challenges within the communications system.

As we all know, in modern societies scientists have to defend why and what they are doing more and more, and normally they are not trained in this field. Therefore, enabling our scientists to fulfil the different jobs a scientist has to be skilled at is a wonderful area where we as academies and foundations can truly help. And, actually, to what extent this is already being done is amazing. Best practice examples are available!

What we have not managed so far is how do we “train” the public to listen to scientists carefully and also prepare them to follow more complex sequences of thought? How can we teach the public not to stop at a certain level of information but to try to accompany scientists on the complicated journey towards knowledge and judgment?

Again, this is a badly needed field of activities for academies and foundations. Here they can join forces and work towards creating new procedures for public deliberation. This is one of the pressing necessities if we want to bridge the gap between what science knows and needs to do and what the public understands and wants and needs to judge.

Finally and again, I think foundations and academies were the first to analyse and to react to the need for increasing the awareness and preparedness of young people to study “MINT” and “STEM” subjects. A lot of initiatives have been taken, already starting with young children in kindergarten and continuing in primary school, where, as I see it, the main topic is not to reawaken interest in natural sciences but to try to maintain and kindle what is already there. There are effective programmes at the ages when secondary education takes place, but what we lack are programmes to train the trainers, meaning to teach the teachers. We have to direct more awareness towards enabling the teachers, who, in many countries, or I would say in most countries, are left alone and do their training individually. We need systematic programmes to modernise their knowledge, their teaching practices and in some cases, their motivations as well. The burden teachers are carrying in today’s schools is largely underestimated and they are often underpaid.

And if this is true in rich countries, how difficult is that situation in poor countries, especially in Africa – a continent which is now coming more and more into our focus, where we need to carefully consider providing help if we want to stop the exodus of educated citizens from those countries. And here, the Lincei Academy which is hosting us today is already at the forefront of designing programmes, and we all hope that Europe is wise enough to support these activities because what we can achieve with these programmes directed and invented by scientists is economically cheap when compared to the costs which are created if we do not react.

Early reaction, prevention, and signalling where new needs are identified, bringing them to public awareness, and providing some funds for those new ideas – this is where academies and foundations join in. But foundations, due to their financial resources, can play an admirable role in implementing ideas and bringing concepts to fruition.

Finally, I believe: joining forces between academies and foundations is an asset which can and should be exploited more. We can all learn from the cooperation of the Balzan Foundation and the Lincei Academy.

Thank you for your patience and congratulations to the winners of the prestigious Balzan Prizes.