

Keynote Address by
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at the occasion of the Award Ceremony of the
National Latsis Prize 2011
on 12 January 2012 at the City Hall, Berne

Scientific Research, Scientific Innovation and the Role of Research Funders¹

In a time when money becomes scarce and budgets are cut, let me share with you some thoughts on the value of research and its relation to innovation. What does *scientific* innovation mean in contrast to other kinds of innovation?

Scientific innovation is the potential and intended outcome of scientific research, i.e. of a systematic process to create objective knowledge and, using the rules of logic, to combine it with existing knowledge. In this picture, research is a *process*, innovation its *result*.

There are other kinds of innovation, not necessarily inferior to scientific innovation, in some cases even more creative, such as the production of art (an innovative act *sui generis*), innovation by association as intended by brain storming, innovation by intuition, and innovation by aimless try and error, that is, by chance, the way how evolution seems to work. The history of science and technology is full of astounding discoveries which did *not* result from scientific research in the strict sense. And yet, for good reasons modern society believes in the supremacy of the scientific process. Due to scientific research, in the past centuries the pace of technological evolution has outrun natural evolution by orders of magnitude.

Scientific knowledge progresses by very different means. On one end of the spectrum is the purely curiosity driven research, that is, scouting for unknown territory. In many aspects, this resembles the try-and-error method of natural evolution. Often an unfruitful desert is found instead of the holy land, or just a dead end. Evolution is full of attempts which failed. But in other cases, one unexpectedly stumbles upon a treasure when something different, perhaps less spectacular was looked for – remember Christopher Columbus. Thus, curiosity driven research resembles the work of the discoverer who sailed the oceans to find new land. However, there are limits to this metaphor, since in contrast to the final size of our earth, the “Ocean of Knowledge” seems to be boundless.

On the other end of the spectrum, research serves a well defined target where the elements to achieve the goal are all in place – at least in principle. Research then means to adjust and combine existing knowledge in order to construct a solid solution to a given problem. This kind of research, by no means less important than the other one, could be

¹ Based on presentation at the Symposium of the Alexander von Humboldt Foundation on “Fostering Curiosity”, London 2009

compared with the work of the surveyors who fully explore and develop the land found by the discoverers.

A creative and sustainable research system needs both, discoverers and surveyors. Although it is true that the work of the surveyor is less risky and its result of more direct and immediate use, without the discoverers the surveyors would eventually lose their right to exist.

Research funding organisations

What is the role of research funders like the *Swiss National Science Foundation* in scientific innovation? – A central task of any research funding organisation is to identify and support high-quality and creative research. The *creativity* of such organisations – in contrast to the creativity of research itself – is reflected in the way (a) funding instruments are designed by which good research can evolve; (b) the quality of research projects is assessed; (c) talented individuals are identified. Since research projects greatly vary in nature, there is no unique best solution for the design of the optimal funding system. To the contrary, funding instruments must be diverse.

A few basic principles should be kept in mind:

1. The ultimate basis for innovation is the 'primary production' of knowledge – the work of the discoverers, to remain in the metaphoric language of the previous paragraph. Discoveries occur primarily by *bottom-up driven basic research*. Wilhelm von Humboldt in his university project for Berlin allegedly said that two things are necessary for good research: solitude and freedom. [Of course, top-down programs have their role as well, but time is too short to elaborate on this issue here.]
2. Therefore, the principal instrument of the portfolio of every funding organisation should be the support of basic research without any thematic restrictions, either by financing project ideas or people. Direct financing of people – as done by our career instruments – is especially important for young scientists who are not yet fully integrated in academia and do not yet have a permanent position.
3. Special attention should be paid to research projects in which the boundaries between disciplines are crossed. Often this kind of research is risky and may need several attempts. It is also often slower than 'traditional' monodisciplinary research since the dialogue between researchers who were brought up in different traditions needs time. The creation of special instruments which allow for the cooperation between different research groups help to create such cooperation schemes. They have to be simple and designed with a long-time perspective. Results should not be claimed too early.
4. A similar category of research which deserves special attention are so-called 'high risk – high reward' projects, i.e. projects which are speculative and aim at stepping over established methods and theories. Such projects should be part of the portfolio of every major research funding organisation, though they ask for special skills of the reviewers.

Researchers

One should not forget: research and innovation are the products of people. The most ingenious research system remains without effect if researchers do not make use of it and academics, especially young ones, cannot be convinced to engage in research as a profession. Thus, to make a research career attractive and predictable is one of the most important tasks of all institutions involved. This is especially important given the fact that most successful research careers are international. The problem of the transfer across borders of social security funds and health insurance schemes has been identified by the European Commission as a central problem. In turn, research institutions and universities are challenged by developing adequate working conditions, salaries and promotion schemes. Finally, organizations like the SNSF must provide funding schemes which extend beyond national borders. In this respect, the new umbrella organizations for RFOs and RPOs *Science Europe* which was founded in Berlin last October will hopefully push its members in this direction.

Yesterday [11 January 2012], the SNSF took the opportunity of its 60th anniversary to organise a symposium for young researchers with the title *Forschungsnachwuchs: macht die Schweiz genug?* [*Young researchers: Is Switzerland doing enough?*] Let me just mention some issues which emerged from the discussion and which were subsequently presented to Minister Alain Berset, member of the Swiss Government being responsible for research, to representatives of the Federal Parliament and the universities as well as to others.

I cannot present to you all the interesting deficits which were identified and all the ideas to overcome them. Instead, let me just mention two central points which both, indirectly and directly affect the life of young academics and the attractiveness of a career as researcher.

1. The obvious first: given the strongly growing numbers of students at Swiss universities (and universities of Applied Sciences), the system needs at least a financial growth rate which matches this growth, otherwise the group of young academics, squeezed between the professors and the students, suffers most. Additional money is needed for teaching *and* for research, since one reason for the strength of Swiss universities is exactly the combination of these two elements.
2. Regarding a more advanced stage of an academic life, the main obstacle against the choice of a career in research is the lack of predictability. A predictable career does not mean that promotion from the bottom to the top, i.e. from PhD to professorship, is a hundred percent guaranteed. To the contrary, as in sport and art at every promotion step there is a selection process, and in many cases it is extremely severe. For instance, the chance to get tenure at one of the highly ranked universities in the US can be as low as 20%. Yet, what makes the system predictable is the 'right of being evaluated' at every career step. In most European research systems people drop out of research not because they were evaluated and failed but because their job simply ended and nobody 'in the system' noticed.

The situation in Switzerland

Where does Switzerland stand in this? – Looking at numbers and rankings, we are doing quite well, not least because we are very attractive world-wide for those who want to engage in scientific research. But we could do better. Like in sport, a small country like ours needs internationality, i.e. open borders for people. But also like in sport, on the long

run as a country we cannot remain successful without having our own strong talents, of young people who were educated here and decided to dedicate their life to scientific research.

Therefore I am extremely happy that we are here today to celebrate a young talent who has mastered all these difficulties with great success. I am convinced that receiving the National Latsis Prize is a sign of success, and I base my conviction on the past, that is on the list of personalities who have received the Prize before and subsequently have undergone great careers. In this sense I am happy to welcome Professor Thomas Stocker from the University of Berne, a former National Latsis Prize winner. He represents one of the many successful examples of Latsis Prize Laureates. Professor Stocker will now talk to us about the role of a scientist between research and society.

Bern, 12 January 2012