

## Lecture

### The transformative effect of frontier science

Speaker: Professor **Maria Leptin**  
(President of the European Research Council, ERC)

**Memo by Anca Radu**  
(Researcher, LAW Department)

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Professor **Maria Leptin** is the President of the European Research Council; she took office from 1 November 2021. Prior to that, Professor Leptin served as Director of the European Molecular Biology Organization ([EMBO](#)) from 2010 to 2021. She also established a research group in Heidelberg at the European Molecular Biology Laboratory ([EMBL](#)). The group studies the mechanics of shape determination during development. After completing her studies in mathematics and biology at the University of Bonn and the University of Heidelberg, Professor Leptin worked on her PhD at the Basel Institute for Immunology, Switzerland (1979-1983) studying B-lymphocyte activation under the supervision of Fritz Melchers. In 1984 she moved as a post-doctoral fellow (1984-1987) to the Laboratory of Molecular Biology (LMB), Cambridge, UK, where she started her research on the embryonic development of *Drosophila*, joining the laboratory of Michael Wilcox. This work laid the foundations for her future work in the field of molecular morphogenesis. In 1988, she was appointed as staff scientist at the same institution. As visiting scientist in Pat O'Farrell's lab at the University of California, San Francisco (UCSF) she began her work on gastrulation, which became the core of her research interests at the Max Planck Institute for Developmental Biology in Tübingen, Germany, where she worked as group leader (1989-1994). In 1994, Maria Leptin became Professor at the Institute of Genetics, University of Cologne, Germany, where she still leads a research group. She spent sabbaticals as a visiting Professor at the Ecole Normale Supérieure, Paris, France (2001) and as visiting scientist at the Wellcome Trust Sanger Institute, Hinxton, UK (2004-2005). Professor Leptin is an elected member of EMBO, the Academia Europaea and the German National Academy of Sciences (Leopoldina), and an Honorary Fellow of the Academy of Medical Sciences. She is also Foreign Member of the Royal Society and foreign member of the US National Academy of Sciences.

**Leptin** began her talk by pointing out that one of her aims as President of the ERC is to build a greater appreciation of what the institution does, which is funding fundamental research. While acknowledging that this aim is 'a tall order', she hopes to foster a more positive attitude towards fundamental research. She further emphasised that the 'ultimate proof' of what the ERC is doing is, in fact, the work of its grantees. She then recalled her predecessor, Professor Jean-Pierre Bourguignon, who would always say, that the best ambassadors of the ERC are the researchers funded by the institution. Therefore, her talk aimed to raise awareness of the importance of research for society, what it should do and what it does for society, but also why society should support research initiatives even more.

She recognised that the researchers supported by the ERC are privileged, if for no other reason, at least from the perspective of the limited number of grants available. And while the grantees have earned this privilege, one should always remember that in the end, it is society who funds the grantees, thus an obligation to research society and to understand the world becomes inevitable. Professor **Leptin** believes curiosity-driven research to be a

‘worthwhile end in itself, even if it does no more than to satisfy a human curiosity’, she reinforced by saying ‘it is a human cultural good and we should cherish it for that’.

To open the discussion, **Leptin** underlined that although the ‘usefulness’ of natural sciences is often easier to explain to society – especially if they have concrete results or outcomes for society, such as the production of a vaccine or even the creation of a fancy telephone –, ‘curiosity-driven research’ in all areas is extremely important for society. She then gave several examples to support this argument.

One referred to Abraham Flexner’s essay on *The Usefulness of Useless Knowledge* (Harpers, issue 179, June/November 1939). Flexner served as the founding Director of the Institute for Advanced Study of Princeton University. In this essay, he describes an apparent paradox of scientific research – the search for answers to deep questions, like the ones motivated exclusively by curiosity and without any concern for practical applications. It proved that ‘useless knowledge’ often leads not only to the greatest scientific discoveries, but also to the most revolutionary technological breakthroughs. For instance, without quantum mechanics we would not have computer chips.

Another example that Professor **Leptin** gave was the one of the invention of the radio, where the Italian engineer Marconi is widely considered the inventor of wireless telegraphy. However, his research would not have been possible without the previous work of James Clerk Maxwell, who discovered the electromagnetic waves. Likewise, in our times, Facebook, Google, and other big tech companies would not have been able to achieve so much without the prior work in academia, such as that on the Turing machine, semantics, or the syntax of programming languages. And these all came from the academic world, from the brilliant minds of researchers who simply followed their scientific curiosity. The list can go on, the lesson is always the same: even though almost never being given the credit for ‘useless knowledge’, this kind of knowledge has always led to the greatest discoveries, which makes it equally important in terms of research.

An even more important aspect is the fact that we still face tremendous challenges, and even some of these are a result of our own making, we, as a society and researchers, still must find solutions. And one way to do that is to remember the goal of research and science. **Leptin** paraphrased Richard Feynman, the American theoretical physicist, who said that scientific knowledge enables us to do all kinds of things, and to make all kinds of things, scientific knowledge is an enabling power to do either good or bad, but it does not come with instructions. Hence, while understanding this power, we should also acknowledge its related responsibility for the ways in which our scientific findings are used. She added, ‘creating a culture of ethics and integrity in research is as important as fostering a spirit of inquiry’. Researchers, thus, can and must be part of the solution to the problems we are currently facing as a society. In the end, it was not politicians who discovered global warming, but scientists.

Science must play its part in reaching a new equilibrium, particularly by trying to undo what we have done. Besides new and improved technologies – which undoubtedly have their contributions in addressing some of these challenges –, the research community should also address ideas such as: how to live sustainably, how to confront inequality, how we might work, live, and educate ourselves in the future, how to organize our economies and our societies, etc.

The 20<sup>th</sup> century would have looked very different without the valuable contributions of sociologists, political economists’ philosophers, and political scientists, who have all tried to make sense of our world, together with anthropologists and historians, who have helped us learn valuable lessons from the past. Since the earliest days, scientists have fought for the freedom of inquiry, as well as for the chance to advance knowledge as broadly as possible. One such example is the so-called Harnack principle, named after Adolf von Harnack. He

fought for the right of researchers to work independently of governments, and to do this Max Planck Institutes were built. There, researchers can independently define their research topics, and are offered the best working conditions.

Related, the ERC rests on the philosophy that researchers know best the most promising research areas to explore. As we could see from the several previous examples, solutions sometimes come from the most unexpected research projects. **Leptin** added that 'science advances not as a single defined point but on a very broad front, and new findings in one area can often open up new opportunities in other areas.' Thus, it is advisable not to put all our funding efforts into a single area that might look like the most promising at one moment, but rather to continue to explore as broadly as possible.

Therefore, researchers who are not able to predict what kind of discovery or in which way they are going to contribute to societal change, should also be given a chance. It has been argued that the transformative effect of science comes from discovering and understanding in greater detail the complexity of natural phenomena, which in turn can lead to new and unpredicted discoveries. **Leptin** reiterated the importance of giving researchers the freedom to explore whatever they find most promising. And this is why, in order to maintain a healthy research system, funding cannot be short-sighted. To conclude her talk, Professor **Leptin** stated that not only 'it is right to invest in long-term curiosity-driven research', but 'it is necessary in order for science to have its maximum impact for the benefit of society'.

### **Roundtable discussion**

A roundtable discussion followed, which counted the participation of EUI President Renaud Dehousse, who explained the intergovernmental nature of the EUI, and credited the ERC as a model for other funding agencies.

Participants at the roundtable discussed the relationship between applied and basic science, many lamenting the absence of career incentives for young researchers to engage in broader interdisciplinary inquiry. The latter is something at the heart of the EUI's philosophy and strategy, as pointed out by several participants. Professor Leptin noted that there has always been a feedback loop between fundamental research and innovation (applied research) which greatly enhances the social value of science, stating "There is no point at which science stops and innovation begins."

During the roundtable, participants asked Professor Leptin how the ERC planned to tackle the accelerating 'revolution' of AI, given its expected impact on teaching, research writing and publishing, project design and applications, as well as scientific evaluation. She reported that the ERC and other European research and innovation agencies had already begun consultations but that there was no formal action yet, given the speed of events. Leptin personally feels that the academic community will have to adapt to, rather than ban AI, and agreed with EUI Economics Professor Sule Alan's observation (from experience in a recent evaluation panel) that AI has the potential for a supporting role in assessment but not in the final decision-making.