

Speech by Prof. Dr.-Ing. Wolfgang Marquardt

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on Taking Over as Chairman of the Board of Directors

at Forschungszentrum Jülich

- This is a translation of a speech given in German -

Minister Wanka, Minister Schulze,
Dr. Huthmacher,
President of the Helmholtz Association, Professor Mlynek,
Ms Bachem, Professor Bachem,
Distinguished Guests from Politics, Industry, and Administration,
Colleagues from Science,
Ladies and Gentlemen,

First of all, I would like to thank Dr. Huthmacher, Chairman of the Supervisory Board of Forschungszentrum Jülich for moderating this event. Particular thanks are also due to Minister Wanka and Minister Schulze who spoke before me, as well as Professor Mlynek and Professor Bachem for their welcome addresses with their kind words and good wishes. Let me begin from a historical perspective, reflecting on the science system in Germany before moving on to speak about some of the future prospects of Forschungszentrum Jülich.

I'd like to start with a quote: Science is fundamentally always a matter for the individual; no development will change this. But there are tasks that simply cannot be accomplished in one lifetime; there are other tasks that demand so much preparation that the individual is not really capable of getting to grips with them; and finally, there are certain tasks whose complexity requires them to be broken down and split up. Some of you may recognize this allusion. It is from a pioneering article on Big Science dealing with science policy written by Adolf von Harnack and published in 1905 ¹. It essentially constituted the basis for a memorandum by the author to Kaiser Wilhelm II, in which he called for the establishment of independent research institutes to co-exist alongside the universities and academies.

¹ B. Fabian (ed.): Adolf von Harnack – Wissenschaftspolitische Reden und Aufsätze, Hildesheim, 2001, pp. 3-9.

In 1911, this memorandum led to the foundation of the Kaiser Wilhelm Society and two of its institutes as the first independent, non-university research institutions in Germany.

This process which took place over a hundred years ago is still important today for non-university research. After World War II, following the foundation of the Max Planck Society and the Fraunhofer Society which emerged from the Kaiser Wilhelm Society in 1948 and 1949, it was continuously refined. The writing of Adolf von Harnack was influential, although it was also interpreted differently by research organizations in defining their own specific profiles. Many of the aspects addressed by Adolf von Harnack can also be found in the Helmholtz Association's mission. However, the latter goes beyond the former in one point, namely in the very point that gives the Helmholtz Association its identity – its commitment to precautionary research, to scientific contributions “to solving grand challenges which face society, science and industry”.²

The Helmholtz mission therefore actively responds to the changes in the models governing science and innovation policy since the 1950s. First of all, basic research was considered the driving force behind social progress. In the 1980s, a link was forged between science and industrial innovation processes as an additional model in an effort to improve the economic competitiveness of the respective national location. It was only in the last ten years that international cooperation aiming to solve the grand challenges facing society has established itself as a further model. These challenges are more than great intra-scientific challenges like Hilbert's problems in mathematics, and they are also more than great technological challenges such as those formulated in the vision of the Apollo Program for aeronautics.

² On the mission of the Helmholtz Association, cf. mission and profile of the Helmholtz Association, in preparation.

Rather, they are more comprehensive, comprehensive in terms of substance, time, and society.³

These three separate models – basic research as the driving force behind progress, focusing on innovation processes, and finally the orientation towards grand challenges facing society – should not be understood as mutually exclusive alternatives. On the contrary, they emphasize, in line with the spirit of the times, different dimensions that an efficient science system must cover equally.

Naturally, the question now arises as to how well-positioned Forschungszentrum Jülich is against the background of this discussion of models. To answer this question, I would now like to link these models to Jülich's own profile, namely to research on key technologies for the fields of energy, environment, information, and the brain.

Because key technologies aim to provide basic competences, research tools, and basic technologies for various fields, because they aim to open new windows in science and application with their completely new approaches, they are naturally coupled with basic scientific research, which here at Jülich, with an emphasis on physics, represents a core competence that has been built up over decades. We will continue to uphold this strategic orientation towards basic research, continue to exploit physics as the nucleus, from which we will carefully build bridges to the life sciences, the geosciences, environmental science, materials science, and engineering.

However, the diversity of disciplines, the knowledge orientation driven by playful curiosity, and the irrevocable pressure to specialize hide the danger of fragmentation. But why would it be problematic, you might ask, if in each

³ German Council of Science and Humanities: The role of science in dealing with grand challenges facing society. A position paper, in preparation.

discipline – as a separate sacred island – outstanding scientific results were to be achieved, affording us a pre-eminent scientific reputation? The answer is simple: we would not fully exploit our potential. We would not utilize existing structures that enable us to deal with complex scientific issues with a high degree of continuity in large interdisciplinary teams, making use of sophisticated research infrastructures.

Outstanding science, which makes productive use of these structures, must be our aim here at Jülich! Only then will we live up to our responsibility of developing a unique selling point – not to gain a head start in the national competition between institutions, but rather as a high-profile actor pursuing unparalleled science with a high institutional adaptability.

This commitment is not a burden limiting creativity; it is an opportunity for us to successfully solve one of the greatest systemic challenges facing science – namely, convergence. Convergence in science, according to the authors of an MIT position paper published in 2011 ⁴, is “the merging of distinct technologies, processing disciplines, or devices into a unified whole that creates a host of new pathways and opportunities.” Expert know-how is not just exploited on an interdisciplinary basis; instead the idea is to merge this in an integrated approach into something new. A paradigm shift is aspired to – not in the disciplines, but rather between them.

Such a convergence is already occurring today in the life sciences, where fragmented research rooted in disciplines makes breakthroughs almost impossible. Research at Jülich aiming to clarify how the human brain works is a prominent example, forcing neuroscience, structural biology, biophysics, information technologies, imaging techniques, and supercomputing to converge and create new key technologies.

⁴ Group of authors: The Third Revolution: The Convergence of the Life Sciences, Physical Sciences, and Engineering. MIT White Paper, January 2011.

This type of research will be more reliant than ever before on specific infrastructures as a key catalyst. Research infrastructures that are not impressive because of their dimensions, but primarily because of their ability to adapt to a particular line of research. Effective research with infrastructures is thus our leitmotif; research on infrastructures remains an important means to an end.

Supercomputers, imaging techniques, and high-resolution analytical methods such as JuSPARC – a new platform for the analysis of non-linear phenomena on ultrashort time scales – remain our central research infrastructures. We will benefit by aligning ourselves with the concept of convergence: not only should complementary experimental techniques be increasingly employed, but they should also be synergistically interlaced with model-based and simulation-based methods in order to efficiently gain more valuable information from data and thus enable deeper insights into nature's own blueprints. This task necessitates new algorithmic methods, as well as new approaches for handling very large volumes of data.

Technology and demonstration platforms also have great potential – for example, the Helmholtz Nanoelectronic Facility here at Jülich – because they can build bridges across the different scales, from the molecule to the technical system, and across the full life cycle, from the understanding as such up to a functional product.

All of this means that key technologies provide an ideal foundation for building this bridge from the understanding to the product – in other words, for turning new, often unexploited, knowledge into something useful, yes of turning it into knowledge that can be harnessed for the benefit of society.

This task quite obviously requires far-sighted and actively managed research processes, but it also requires a sense of responsibility on the part of researchers that they too should help to ensure that the question of whether and how their

results can be used – be it in the near future or in the longer term – is explored and answered.

Forschungszentrum Jülich and the Helmholtz Association should establish supporting structures to ensure the continuity of research work in cooperation with or solely by other actors, possibly even those outside the science system, in order to derive solutions to problems facing society. This task, which addresses the innovation-oriented science policy model, goes far beyond established mechanisms of technology and knowledge transfer.

Once we have combined our research findings and technological developments in the form of key technologies, we will exploit these even more rigorously in order to consolidate systems research and research aimed at finding solutions in Jülich's core areas. Although we are well-positioned with our activities in biomedicine, bioeconomy, agrosphere and environmental research, accelerator physics, information technologies, materials science, and energy research, in order to utilize the diverse links and ensure a balanced push and pull between key technologies and solutions, particular emphasis will be placed on energy research.

Forschungszentrum Jülich must work together with partners in the region to further develop this area and shape it into a national priority. By so doing, we want to make a significant contribution to transforming the energy sector in cooperation with our partners. Our aim is to ensure complementarity of activities within the Helmholtz Association; cooperation must be given precedence over competition.

The science policy model behind innovation processes is inextricably linked to that of the grand social challenges. However, the latter goes much further because it does not simply oblige science to contribute to national economic welfare. Instead, the model of the grand challenges is associated with the

expectations that society has of science, namely that science align its knowledge and innovation processes to meet the needs of society.

Challenges are identified in an unconstrained and open process that often transcends national borders in consensus with all areas of society – politics, industry, science, and civil society. Solving these challenges demands social transformations, which can only be implemented on a scientific basis.

Forschungszentrum Jülich is very well-equipped for this with its fields of energy, environment, information, and the brain because these fields are closely related to the needs of society, which have been identified as the grand challenges facing society. However, it is worth taking a closer look to clarify the extent to which we can meet the grand challenges facing society with our research topics and processes, in other words, whether they are adequate in terms of their overall social, temporal, and objective character:

- Perhaps we should ask ourselves whether we have examined the different social value and target systems sufficiently, and whether we have weighed them up in a discussion with all social groups in order to develop a pertinent vision for research. Have we chosen the constellation that is most likely to allow us generate research findings that will in turn facilitate and support social transformation processes – for example, to transform the energy sector and mitigate climate change?
- We must also clarify whether the correct governance mechanisms have been put in place in order to ensure both the stability over necessarily long periods of time as well as the ability to revise and adapt our research accordingly with respect to targets, programmes, and processes.
- And finally, we must ask ourselves whether we really are pooling all relevant knowledge beyond our own professional, institutional, and national boundaries in a transdisciplinary manner, both within and outside of science, in order to find systems solutions that are not just technolo-

gically mature but are also sustainably implementable and will meet with support from society.

Obviously, there are no fast or simple answers to these difficult questions. But we will have to face them – and not just in Jülich.

The discussion about science policy models illustrates that a research institution cannot meet the multifaceted demands by itself, even when its research is strong and it has access to extensive resources. Particularly here at Jülich, we should exploit the diverse connections that exist here in a multidisciplinary centre as an opportune structure in order to create considerable added value in the form of collaborations. The nature of this interconnectivity must be elaborated in a differentiated manner depending on the corresponding aims and specific context. Cooperation with universities is particularly important in this regard.

Strategically planned institutional alliances enable the partners to enhance their own profiles and consolidate their core competences, before they – perhaps even in several fields – share tasks and work together on a stable, long-term basis. Due to the necessarily close interdependence on the governance and work levels, the partners must be geographically close to each other or have a similar “family” culture. For Jülich, in addition to the Helmholtz centres, the best universities and non-university research institutions in the region are ideal strategic partners.

Expanding broad-based regional centres of excellence or clusters focusing on a specific topic that transcend institutional borders would logically follow on from the government’s excellence initiative against the background of augmented science policy goals. As a second instrument, specialized network-like alliances with a lean shared governance should be mentioned. They are conceived in the form of projects on a shorter time scale, allowing them to be quickly and flexibly reconfigured. The best approach here is to unite the most suitable partners, not just nationally, but also internationally.

Alliances aiming towards innovations must involve industry in a central position alongside science partners. Against the background of the grand challenges facing society, depending on the context, actors from civil society, administration, and politics must also be integrated. In this process, we shouldn't limit ourselves to transfer in the strict sense of the word – namely to passing on our findings. Instead, the guiding principle should be joint research, development, and implementation. Here, we must continue to devote special efforts to the ties that Forschungszentrum Jülich has with social actors in the region – because we, as a large employer, want to take responsibility for the region, and because our achievements are first recognized and acknowledged locally.

With these thoughts on networking, I have come to the end of my brief description of how future research activities will be framed here at Jülich. I have made a conscious decision to pursue the development lines of the last few years with as much continuity as possible, but in so doing to also reflect on opportunities that emerge from the existing challenges facing the science system as a whole in the present scientific and science policy context. You must forgive me for addressing only the programmatic aspects here today.

Tomorrow, I will begin work on specific courses of action, on small matters and more important ones, working together with colleagues here at Forschungszentrum Jülich and with all of those connected to Jülich in some form or another. I'm really looking forward to these shared tasks. And I can reassure you that I will tackle them with enthusiasm and commitment. Things have been made easy for me from day one because Forschungszentrum Jülich is already well-positioned in every respect.

I would like to thank all of you who have helped to achieve this, particularly you, Professor Bachem, as you have headed the centre very successfully for the past eight years and have guided its development to this point where I now have the honour of taking over the reins. Professor Bachem, I wish you all the best for

the time to come after Jülich. And if you miss your second home here at Jülich too much, you're always welcome to drop by for a cup of coffee. In this sense, on behalf of all of us here this evening, "Thank you, take care, and see you soon!"

Before moving on to the next part of the evening, I would like to thank you all for joining us here at Jülich for this event marking the end of one era and the beginning of the next.

Professor Bachem and I see this as a sign of your strong ties with Forschungszentrum Jülich and with its employees. On behalf of all of us, I would also like to thank Dr. Rother and her team for organizing this impressive event.

Professor Bachem and I would be delighted if you would all stay a little longer and enjoy the more relaxed part of the evening, when we will all have an opportunity to catch up or get know each other. We will now move from here, from the Seecasino, to the Central Library, which is only a few minutes' walk away. Please follow those who know the way. Snacks and drinks await us there. And the music lovers among us won't be disappointed! RWTH Aachen University's Big Band will entertain us with a selection from their repertoire.

Professor Bachem and I would be delighted if you would all join us for this more social side of the event. We'll see you there!