Welcome Address by the State Secretary at the Federal Ministry of Education and Research
Dr Georg Schütte
at the "Systems Biology and Systems Medicine" session
of the World Health Summit
at the Federal Foreign Office in Berlin
on 20 October 2014

Check against delivery.
Ladies and Gentlemen,

We owe many of the improvements in our ability to prevent, diagnose and finally treat diseases to the findings of biomedical research in recent decades. Life expectancy and the quality of life – including the quality of life for the elderly – have risen considerably.

Nevertheless, we see that the effects of medicines vary greatly from person to person. And the biggest risk factor in clinical research is the step involving the transfer of results from the laboratory to the patient. What is good for a mouse does not have to be good for the human organism. Failure at the decisive hurdle – the "first-in-man study" – does not only cost a lot of money but also a lot of time.

Ultimately, what we lack are reliable models which depict either the human organism as a whole or individual organs. We lack models that we can use to predict which medicines will work on which patient or – even better – how diseases can be prevented in each and every individual.

The ability to make such predictions would represent a revolution in the field of medicine. I would like to argue that this revolution is already underway – with the help of systems medicine. Systems medicine also involves the handling of infinite quantities of data – so-called Big Data. Both topics are
high on the Federal Government's agenda. I am therefore delighted to speak a few introductory words on these important, forward-looking topics.

We are currently in the age of Big Data. More and more data are being generated at an increasing speed. The Digital Agenda is the Federal Government's programme for systematically discussing the opportunities and uses but also the risks of Big Data. Science Year 2014 – "The Digital Society" – is dedicated to this topic area.

Biomedical research plays an important role in shaping the process of digitalization. This is important and only right. After all, the data generated through biomedical research are of considerable importance – and highly sensitive.

When I think about the data produced in genomics, for example, I can hardly imagine a set of data which has such great potential from the point of view of biomedicine but at the same time raises so many legal and ethical questions. There is probably nothing more private than one's own genetic make-up. Patients and doctors must weigh up between the medical use of data and the personal integrity of the patient.

Research policy must also consider whether the personal advantages or the personal risks involved are appropriate to the scientific knowledge gained.
The Federal Government therefore plans to launch a separate funding priority in the field of medical informatics. The issue of solving the conflict between potential uses and justifiable risks – also in the context of the accessibility of patient data – is one of the topics on today's agenda. I am looking forward to hearing your views.

The stakeholders in systems biology and systems medicine also play an important role as drivers for promoting the utilization of data. By taking a cross-indication approach, they are opening up a completely new dimension which complements existing organ-oriented or indication-based research. The Federal Government has reacted to this new approach among other things by establishing the Berlin Institute of Health, where the Charité and the Max Delbrück Center for Molecular Medicine are pooling their knowledge under the paradigm of systems medicine.

Systems biology and systems medicine stand for the development of predictive models – models of individual cells, tissue, organs and ultimately of the entire body. I do not dare to predict when we will succeed in modelling the entire body and creating the "virtual human". Liver research demonstrates the progress that has already been made at organ level: Following 15 years of research, most recently in the Virtual Liver Network, we will soon be introducing a measure to translate research findings into practice.
Pathophysiological modelling is indeed the key to developing therapies and to preventive medicine. If we succeed in simulating individual organs or the entire body using computer graphics, we will be able to make "electronic" predictions regarding the occurrence of diseases and to design corresponding innovative therapies.

This will only be possible, however, if we collaborate efficiently at international level – which is already happening in individual cases. In order to accelerate this process we need to pool strengths in future and make agreements at international level. Access rights, in particular, must be coordinated and harmonized internationally when agreeing uniform standards for data collection and storage. Only thus can we make efficient use of Big Data's potential in the field of biomedicine.

Exploiting the potential of Big Data not only calls for an international strategy but also a holistic mindset and approach on the part of each and every researcher. Biologists, medical scientists, computer scientists, mathematicians and engineers must work together in the field of systems medicine, develop a common language and demonstrate mutual understanding.

Furthermore, the management of Big Data in general and systems medicine in particular goes hand-in-hand with steps to dismantle traditional institutional and disciplinary boundaries. This breach with traditional cultures brings with it something
which I believe is particularly important for science, for industry and for society: I am talking about creativity and innovation.

Big Data, patient data and systems medicine are already confronting us with enormous challenges while their real benefits are often fairly vague. Let me therefore close by quoting an example from the field of cancer research which illustrates the significance and potential of systems medicine.

The sequencing of the tumours of all cancer patients is already imminent in highly developed countries. This will enable concrete predictions regarding the effectiveness of treatments. Individualized cancer treatments are within our reach and would certainly revolutionize medicine. The systems medicine approach has great potential because it can be applied methodically to all areas of indication.

To finish, I would like to propose a few questions for inclusion in your discussions:

First of all: How can we make even better use of the potential of Big Data?

Secondly: What tools do we need to make data management even more efficient?

Thirdly: How can we achieve international standards for collecting and securing comprehensive data and making it available to a wide research community?
And fourthly: How do we deal responsibly with the enormous risks attached to patient-related data, in particular from the legal and ethical point of view?

I am looking forward to an interesting keynote. Thank you.