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The Role of Academies in Science-based Policy Advice: The Case of Biomedicine and the Life Sciences

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The German National Academy of Sciences Leopoldina is greatly honoured by receiving the Gold Medal of the Academia Europaea. On this occasion, it might be appropriate to talk about the role of academies in science-based policy advice. The authors would like to address the question: what general aims should the academies achieve – particularly in respect to biomedicine and the life sciences?

Progress in Biomedicine and the Life Sciences as a Topic in Science-based Policy Advice

There are as many topics for academies and their science-based policy advice as there are societal challenges caused by developments in science and technology or analysable by scientific methods. During the last 40 years, the tremendous progress in biomedicine and the life sciences has been one of the core issues of science-based policy advice and it is, in our view, a good bet that this will not be changing in the near future.

Even a superficial look into the history of science since the 1940s provides us with a reason why progress in biomedicine and the life sciences is a core issue of science-based policy advice. In particular, research into the molecular foundations of living systems has been advancing our theoretical understanding of the nature of life and the clinical abilities of physicians in an ever-accelerating pace. Biomedicine and the life sciences involve many of the most promising research programmes of our time, they are also revolutionizing the art of medicine – and, therefore, increasingly influencing human self-understanding.

Examples for this abound – let us just mention some of the topics addressed by the German National Academy of Sciences Leopoldina in the last few years. These topics include the fight against zoonoses and the impact of climate change on infections as well as the challenges of antibiotics research and public health policy for infectious diseases. Statements have been published on predictive genetic diagnostics as an instrument of disease prevention and on the effects of a limited legal approval of pre-implantation genetic diagnosis in Germany. Challenges and opportunities for taxonomy, a discipline of biology with a long history, and for synthetic biology, a promising new field of research, have been analysed. Scenarios for the future development of high throughput ('omics') technologies in Germany have been developed.

In the last few years we have also published statements and discussion papers on Genome Editing. In November 2018, a Chinese researcher announced the birth of twins who were genetically modified by CRISP/Cas9 gene scissors to protect them against HI-virus infection. We do not know what the scientist has really done in his laboratory. In any case, such an experiment is far beyond the frontiers of responsible research. Apparently, healthy embryos have been genetically manipulated, and nobody can know today what the short- and long-term consequences of this manipulation will be.

Research on genome editing still is in its infancy. Any responsible researcher despises the Chinese scientist who deliberately chose to risk the health of the twins, and of their offspring, for his own personal fame. The community of life scientists and physicists forcefully condemned this experiment. What it shows is that we do need globally binding rules for the ethical application of genome editing in humans. In our view, science academies have a great responsibility for the development and implementation of such rules.

Democracies need Science-based Policy Advice

In democracies, citizens who are interested in, or concerned about, the consequences of biomedicine and the life sciences on their living conditions, can freely speak out for or against public policies on scientific research, technological innovation, and health care. This usually results in a broad spectrum of opinions – e.g. on the regulation of stem cell research – that are discussed in the public sphere and taken into consideration in political decision-making. The pluralism of legitimate interests voicing their diverse views is a fundamental characteristic of democracies and pertains to normative (juridical and moral) dimensions of public policies on science, technology and health. In open societies, those interests are part of the bargaining processes, at the end of which decisions about public policies are made.

Yet evidence-based policymaking needs state-of-the-art information on those high-impact sciences. It needs reliable advice on what options for dealing with highly debated issues in science and health policy can most probably help reach politically set aims. Moreover, it needs critical competence in scrutinizing the goals and

objectives of public policies on ethically challenging issues, which are not in short supply when it comes to biomedicine and the life sciences. Academies can make a strong contribution to fulfilling those needs.

General Aims of Science-based Policy Advice

Although the issues for academies and their science-based policy advice are of great variety, the challenges such advice encounters can be classified into two general types.

Enhancing Cooperation

The first type of challenges comprehends any kind of allocation problem: given an agreed upon policy goal, it is necessary to determine the optimal use of different kinds of resources in terms of costs and benefits.

An important example for this is giving advice on the fight against antibiotic resistances. There is broad agreement on the principal goals of public policy on antibiotics: the spread of antibiotic resistances must be reduced and new antibiotics have to be developed. The general means to reach these goals are, to a high degree, also uncontroversial: more research is needed, the transfer of scientific discoveries into clinical application must happen more smoothly, and physicians and the public have to be 'sensibilized' about the proper use of antibiotics.

However, it is a great challenge to give advice on how the human, institutional, financial and other resources of science, innovation and public health systems should be used optimally in order to stop the spread of antibiotic resistances and to develop new antibiotics. Not only does this challenge involve questions of funding and organizing science, from basic research to clinical studies, it also implies legal frameworks (e.g. the certification conditions for new active agents), social aspects (e.g. health education on the sensible use of antibiotics), and economic factors (e.g. tax incentives for research and development).

The general aim of science-based policy advice on allocation problems arising in the context of biomedicine and the life sciences should be to enhance cooperation between all stakeholders so that the use of resources for public policies on research and health is optimized. Communicating to these stakeholders the best available scientific information about what we know and what could be done, as well as evaluating, against given policy goals, as impartially as possible the options for action, are the two main instruments to reach that aim.

Developing Strategies of Fair Bargaining

New research programmes in biomedicine and the life sciences do not raise questions simply of the optimal allocation of resources. First and foremost, the programmes have a high potential to pose problems in the appreciation of values. An example is

synthetic biology, the merger of biology, chemistry, and engineering that further develops genetic engineering and biotechnology to modify existing living systems or to construct new ones from scratch. Synthetic biology is quite a young research programme that will become an even more important topic for science-based policy advice in the near future.

Moral arguments in favour of synthetic biology are usually based on the anticipated benefits for health, food or the environment. Nevertheless, the public debate about what goals public policies on synthetic biology should pursue, will not lead to a consensus between all stakeholders.

It is not a legitimate aim of political decision-making in democracies to suppress moral pluralism. Nor is it necessary for academies to watch for unanimity about normative questions before they start work. In such areas as synthetic biology, there will always be stakeholders with different moral standards involved in making political decisions about science and health policies.

The best science-based policy advice can reasonably hope to do in making the decisions of the parties involved more intelligent is to develop strategies of bargaining between the stakeholders that raise the probability of achieving a compromise, e.g. in the regulation of synthetic biology by law. Such compromises allow the involved parties to define the goals of public policies on research and health as consentaneously as possible. Academies thus become the forum of a properly managed debate with understandable and reliable communications that address the challenges of synthetic biology. Any step towards such an ambitious, yet realistic understanding of the role of academies is in the right direction for science-based policy advice – in Germany and Europe.

Concluding Remark: Against Expertocracy

In democratic and pluralistic knowledge societies, academies can fulfil three functions in science-based policy advice.

- First, they provide political decision-makers with state-of-the-art scientific knowledge that is reliable, relevant to societal concerns, and transparent in respect to uncertainties and open problems of research.
- Second, academies systematically analyse probable contributions of policy options to the solution of societal challenges and evaluate them in the light of given policy goals and objectives.
- Third, academies participate in the debate on policy goals and objectives by probing the rationality that underlies normative ideals and concepts of common welfare.

Science-based policy advice in democracies ought to respect the division of labour between politically responsible decision-makers and advisers who want to help find reasonable ways of defining and implementing public policies. Otherwise,

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the legitimacy for political decisions would erode and trust in the impartiality of academies would decline. Winston Churchill reportedly once said, 'Scientists should be on tap, but not on top' (Churchill 1965, 127). In democratic knowledge societies, science-based policy advice will be the exact opposite of 'expertocracy' or 'technocracy'.

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This version of a speech given at the 2018 Annual Congress of Academia Europaea and Young Academy of Europe in Barcelona is an abridged and slightly altered version of Hacker *et al.* (2015).

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