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Focus: Global Science

The Future of Science. A Welcome Address

JÜRGEN MITTELSTRASS

Konstanzer Wissenschaftsforum, University of Constance, D-78457 Konstanz, Germany. E-mail: juergen.mittelstrass@uni-konstanz.de

Ladies and Gentlemen, dear members of the Academy. Welcome to the annual conference of the Academia Europaea – The Academy of Europe. This is the second time the Academia Europaea has held its Annual Meeting in the United Kingdom – and the moment could not have been chosen better. The first meeting, held in Cambridge, although not in the founding year 1988, but in 1989, marked the foundation of the Academia. This year's meeting (2008), here in Liverpool, this year's European capital of culture, marks the Academia's 20th anniversary. Twenty years is but the blink of an eye for the life of science and its institutions, but for a new institution such a period means that it is out of the woods, that it has gained a foothold, and found its place among its peers, that it knows how to work, but also to be merry – in an academic manner, of course, in scholarly exchange. I am highly pleased by how many participants have joined us for this festive meeting and the associated conference, and I am glad to be able to welcome so many guests.

Let me briefly, as in the past years, introduce the Academy to our guests. The ideas behind its foundation 20 years ago and the principal goals that we set for ourselves are similar to the objectives of any Academy of Science, but this one in particular has always been oriented towards the European level, in order to promote a unified approach towards European science and higher education. The aims of the Academy were, and still are to this day, ambitious, yet well within our reach. We attempt to promote a broader appreciation of the value of European scholarship and research in all fields of learning, to encourage interdisciplinary and international research within these fields, particularly regarding issues unique to the political, cultural and economic constellation of Europe, to identify topics of importance to science and scholarship, to encourage the highest possible standards in research and

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scholarship, and – last but not least – to promote a better understanding among the public at large of the benefits garnered through knowledge and learning.

Let me add, as I have done so many times before, a few words about the science–policy goals we hope to achieve. There are numerous actors fighting for space on the turbulent European stage. Brussels, it seems, changes its advisory bodies in the sciences the way some people change their shirts; and every institution with serious intentions in the European arena, such as the European Science Foundation, Euroscience, ALLEA and our Academy as well, is attempting to assert its own special set of interests in science-policy matters. Thus, despite our original intention to be *the* transnational European Academy, we have long since been forced to make room for many new players on the stage. Taking stock of this crowded cast of able competitors, it is crucial that we continue to develop a more refined concept of our own initiatives, that we sharpen the Academy's public profile, and that we form proper alliances in an environment that is growing ever more competitive.

Still, our main aim is to give the Europe of the scientists a voice in the public arena – a strong, prominent voice. Already, within the last 20 years, a great deal has been achieved towards reaching these goals, but of course not all of our ambitions have yet been realized**.** However, if we don't tread carefully, better organized institutions and institutions with more stable financial backing could easily supplant us. Unfortunately, and I find myself forced to mention this every year, in financial matters, we are still not the strongest candidate in the race.

But we should not dwell on the negative, for there are many positive matters to be reported. The Academia Europaea has stood at the cradle of the European Academies Science Advisory Council (EASAC), and we continue to play an active part in its policy advice work. Furthermore, the Academy has contributed significantly to bringing the European Research Council into being, a development which, as we all know, represents a massive step forward in European science politics. It has now become an accepted notion that the Europe of science does not merely require resources for path-breaking technology-oriented research, but for fundamental research as well. And this will include the Humanities, which up to now have been systematically neglected and under-appreciated in European policy. We have responded to this challenge in various ways, organizing several conferences relating to the Humanities and agreeing on a statement of purpose concerning the role of the Humanities in Europe. Moreover, a series of workshops has been dedicated to fundamental research, covering basic ideas in science. The series has begun with workshops on symmetry and complexity, and next year it will continue with a workshop on causality. We do not want just to campaign for fundamental research, but also to work for it.

2007 in Toledo, we talked about science as culture. As al-Andalus illustrates in an impressive historical fashion, science too is the expression of culture and, at

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the same time, it is capable of uniting diverse cultures (such as Christian, Muslim and Jewish culture).[1] This hasn't changed today. Science, especially when it addresses concerns that are of fundamental importance to human beings, has a great cultural and humane power, and science is maybe the last big adventure on our aging planet. Please allow me a few short remarks about the future of science and learning, on the occasion of this ceremony, celebrating our birthday.

The world has become poor in adventures – intelligent adventures. Science is such an adventure. Science, beyond all the routine that it shares with other enterprises, represents ever-new departures into the unknown, intelligent curiosity paired with an inexhaustible imagination and sober understanding, and desire for the new.

The new, and the search for the new, belong to the everyday, and not just to the weekend of science, even if the new is not 'everyday' in the sense that it occurs every day. The programme and the self-understanding of science are always reckoning with the new, they expect and search for it. Science can be disappointed in this regard, but it cannot be detained. That is why a long-term extrapolation of the state of research of a science is not possible, and why a present science cannot speak for a future one. We don't know in doing science what we will know in the future. We don't even know what we will be *able* to know in the future, or what we will need to know, although that would spare us much time and money. For this too – knowing what it is that we do not need to know – would mean that at least the paths of research could be extrapolated, and that its possible boundaries might be predicted.

But this too is not the case. Even if we prefer to speak today of the boundaries of knowledge, and thus of the boundaries of science, we mean by this not *theoretical* boundaries, but *practical* ones, for instance economic limits (for scientific progress is becoming in some areas unaffordable), or ethical limits. These are found where scientific progress, instead of improving the conditions of Man, turns against him. In the theoretical domain, on the other hand, science is limitless. There are no boundaries set on the mind, even if philosophers and theologians have always liked to speculate about such limits, thinking they could discern them either in the things themselves, in other words in a limited fount of nature, or in the organization of human understanding, that is in a limited capacity for information, or in the difference between human and divine understanding.

Still, science has no subscription to the new, and no unbeatable strategy for finding it. There are many ways to new scientific insights – and many ways to miss them as well. The latter are the dead ends. They give out at some point, leaving those following them looking old and tired. What began as an adventure ends in the all too well-known.

What is more, whoever wants the new must also be prepared to deal with the unplanned, the unpredictable, and must be prepared for many disappointments – he has to be prepared for an adventure. He has to travel a long road, and it should

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be said that society must be prepared to finance such long trips. For adventures also have to be financed. Among these trips one must count, above all, fundamental research. Fundamental research is not an irritating invention of the sciences, created in order to pursue personal, and generally expensive, inclinations that also happen to be fun. It is rather the soil upon which the fruit of insight blossoms. Those who try cheap fast-food instead will be sorely disappointed. Egg-factories and industrial farming are not models for successful science. In addition, the question of whether science always investigates the right objects is in the final analysis unanswerable, even if – because of a shortage of funds, or because of research topics such as 'the smile in Molière's work' or the 'pairing rituals of dwarf rabbits' – this question must repeatedly be posed. Freedom of research, which is most emphatically demanded for fundamental research, is occasionally also science's burden, and sometimes its guilty conscience.

Whoever wants to support science – and that should include everyone, considering the modern world's dependence on science – should be sceptical of promises of quick success. Science is not a product that gives in to the demands of development, production and marketing. This holds true just as well for computer science and fusion research – eminent examples of a desirable orientation towards practical applications – as it does for cancer research. The successes in these fields, on which many of our best researchers are working, are built on much sweat and persistence. There is no progress to be made in cancer research without a steadily improving knowledge of genetics and molecular biology, and to think otherwise is to demonstrate one's ignorance. Innovation in science takes time, sometimes a lot of it. And an adventurous mind has to have the corresponding stamina.

Science itself teaches us that science will not run out of questions and problems in this process. Every scientist knows that for every scientific problem that is solved new problems arise, that for every question answered new questions are posed, that for every insight gained new ignorance is revealed. And that this ignorance does not merely refer to further decimal places is a very common experience of daily scientific work. We can visualize the problem in a picture that takes up a metaphor already used (in a different context) by the philosopher and mathematician Blaise Pascal,[2] and employed again (in our context) by Herbert Spencer:[3] scientific knowledge is an ever-growing sphere floating in a space of ignorance. As the sphere grows, its outer surface grows, too, and thus the surface of contact with ignorance grows.

This picture, which sees no limit to knowledge, can be interpreted in two different ways: a pessimistic version and an optimistic version. The pessimistic interpretation says (and here some recollection of the mathematics class may be useful but is mercifully not absolutely necessary): if it is the radius of the sphere that represents knowledge, then, as the sphere increases in size, the area of

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the surface increases faster than the length of the radius, namely, as the second power. Thus ignorance grows faster than knowledge, or in other words: scientific research produces a faster growth of ignorance than of knowledge. This is a startling but – at least with regard to the elementary mathematics involved – correct result. In the optimistic version, it is not the radius of the sphere that represents knowledge but its volume. As the sphere grows, its volume grows faster than its surface, namely as the third power of the radius. In this case (scientific) research still produces ever more ignorance, but knowledge is growing faster than ignorance.

Whichever interpretation of this sphere of knowledge one chooses, one thing is clear in this picture, and probably also in the experience of those scientists who do not deal immediately with the grand theories of their disciplines or with the grand design of all knowledge: the growth of knowledge does not make the world of the unknown, of the not-yet-explored any smaller, but rather larger. Research tasks grow with (growing) knowledge; there is no limit to the unknown. Rather, it is the proximity, the constant contact with the unknown, sometimes – not only in the minds of philosophically minded scientists – the scent of the unthinkable or unimaginable (or what is taken to be so) that keeps science under its spell, that constitutes its stamina, even where what is already known seeks to present itself as knowledge on the brink of completion, or seems to be unreachable with the available means, or even seems to be inaccessible in principle for epistemological reasons. Here, the limits are really dissolved, and (scientific) knowledge presents itself as essentially limitless. Neither are there boundaries with which the scientific understanding collides and gets a bloody nose, nor are there boundaries that form the contours of something completed.

Back to the adventure science. The new in science, as I mentioned previously, is not only hard to reckon, but it is often inconstant and remarkably democratic. It blesses organized researchers at work at their desks and in the lab, after many pencils and much helium are used up, and it blesses the disorganized as well, for instance while shaving, jogging or making coffee. The new often comes unexpected, as an unwanted adventure, the good fortune of the undaunted. And it is in just this that the proper, lasting challenge of science and to scientists lies, namely in their supposed foolishness, which is the handmaiden both of truth and of tomorrow's utility.

The contributions of the next few days will bear witness to what I have said. They will let us feel the adventure science, and the positive infinitude which, as illustrated by our sphere of knowledge, lies in its questioning and its intellectual curiosity. We will have an impressively diverse programme here in Liverpool. The scope ranges from astrophysics, biology and health theory and politics to almost all aspects of science and medicine. I especially congratulate our local organizer of this programme, Professor Ole Petersen, who has done a wonderful

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job, and I thank all of our sponsors: The Royal Society, the University of Liverpool, the Leverhulme Trust, the Heinz Nixdorf Foundation, the Medical Research Council – who have sponsored the Erasmus lecture and one of the sections – as well as the Portland Press. Not to forget the Cambridge University Press for its book prizes for all of our Burgen scholars. I also thank all speakers on the programme, some of whom have travelled from afar, for their help in the programme's realization. And I sincerely hope that all of us will enjoy our time in the city of Liverpool – scientifically, academically, as well as socially. It has always been a city of science, industry, culture – not to forget the Beatles – and scholarly exchange. And our presence here is most fitting.

References

1. J. Mittelstrass (2008) Focus: al-Andalus – the Three Cultures. Welcome Address. *European Review*, **16**, 85–90.
2. B. Pascal (1963) *Oeuvres completes*, edited by L. Lafuma (Paris: Éditions du Seuil), pp. 525–528.
3. H. Spencer (1890) *First Principles* (Edinburgh: Williams and Norgate), 16f. See also J. Mittelstrass (2001) Gibt es Grenzen des Wissens? In: J. Mittelstrass, *Wissen und Grenzen: Philosophische Studien* (Frankfurt: Suhrkamp), pp. 120–137.

https://doi.org/10.1017/S1062798709000878 Published online by Cambridge University Press