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JOINT ACADEMY DAY 2019

**SLOVENSKA AKADEMIJA ZNANOSTI IN UMETNOSTI (SAZU) |
SLOVENIAN ACADEMY OF SCIENCES AND ARTS (SASA)**

**AKADEMIE VĚD ČESKÉ REPUBLIKY (AVČR) |
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SLOVAKIAN ACADEMY OF SCIENCES (SAS)**

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**ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN (ÖAW) |
AUSTRIAN ACADEMY OF SCIENCES (O_eAW)**

15th NOVEMBER 2019 – AUSTRIAN ACADEMY OF SCIENCES

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EDITORIAL

ANTON ZEILINGER

We started the series of Joint Academy Days in 2018, together with the Royal Academy of the Netherlands. The idea of these days is to meet and talk about topics of common interest. This year, we are delighted to be meeting with, not just one, but four-plus-one academies: the V4 academies – the Czech Republic, Slovakia, Poland, and Hungary – and some representatives of the Slovenian Academy.

I should mention that, just before we began the second Joint Academy Day at the Austrian Academy of Sciences, a meeting took place between the V4 academies plus Slovenia to discuss issues concerning long-term perspectives. For example, what is needed to create a true common European research area? This is a huge challenge. And the challenging aspect is not just competing successfully for ERC grants, but also making it so that, ultimately, it would be equally

interesting for a scientist from, say, Ljubljana to go to Munich as for one from Munich to go to Ljubljana.

We already have many collaborations with the V4 academies and Slovenia. There are about 130 ongoing joint research programs. This Joint Academy Day will help to strengthen the cooperation between our academies and to garner fruitful results regarding the issues under discussion. I therefore wish to thank the total of 34 scientists from the V4 academies, Slovenia and Austria for being part of the second Joint Academy Day, organised as a workshop with six panels.

For the purpose of the present publication, the contributions and discussions, including those from the audience, have been edited and slightly abridged.

I wish you a stimulating read.

INTRODUCTION

OLIVER JENS SCHMITT

What is the idea behind the Joint Academy Days? Like most of the academies represented here, the Austrian Academy of Sciences is founded on two pillars or, rather, three: the Learned Society; the institutes; and the Austrian Academy of Sciences is also a funding institution.

When the institutes and the Learned Society were gradually separated, the question arose about future possibilities for learned societies, both at the national and international level. The concept of Joint Academy Days also came about to activate the very wide networks that individual academy members tend to have.

We wanted to use the academies and the learned societies, in particular, as a kind of interface between academies. In the first two years, this has been restricted to the European level. The next Academy Day will be held jointly with the Royal Society of Canada. The motivating question is how we can establish a network

interface for the members of learned societies.

We are particularly glad and honoured that this year we are able to host the V4 academies and the Slovenian Academy of Sciences and Arts. In terms of organisation, and also of identifying common topics, this was certainly much more complex than working bilaterally. However, I think that we learned from the first experience with our Dutch colleagues.

Identifying common topics is certainly one of the most interesting parts of the whole process because there are a range of approaches, and these approaches are also reflected in this afternoon's programme. They more or less follow one of two directions: science policy topics, and some specific, very important scientific topics. Each academy took the lead in one of the panels, and all the academies were invited to propose members to take part in these discussions.

The first panel concerns the nature of a fully functioning language within the European Union, with an emphasis on developing academic and technical language. The lead here is taken by the Slovenian Academy of Sciences and Arts. Andreja Žele, from the Department of Slovene Language and Literature at the Faculty of Arts of the University of Ljubljana, will be the panel chair. She is also deputy head of the Fran Ramovš Institute of the Slovenian Language.

The second panel focuses on the implications of climate change for water supply and related issues, a topic proposed by the Czech Academy of Sciences. The discussion will be led by Václav Šípek from the Department of Water Resources at the Institute of Hydrodynamics.

The third panel concentrates on the development of ERC grants. Unfortunately, Éva Kondorosi from the Hungarian Academy, who should have chaired this panel, cannot attend because of health reasons. Our most

sincere wishes for a fast recovery. We are very grateful to the president of the Hungarian Academy of Sciences, László Lovász, who stepped in to chair this panel.

The fourth panel will debate something that is very close to what we are doing here: the role and position of academies and, especially, the learned societies. Peter Moczo from the Slovak Academy of Sciences will guide us through the debate. He is President of the Learned Society and works at the Institute for Earth Science of the Slovak Academy of Sciences.

The topic of panel five was proposed by our Polish colleagues: direct democracy. This was also the subject of a debate at the Austrian Academy of Sciences a few months ago. Panel five will be chaired by Andrzej Rychard, director of the Institute of Philosophy and Sociology.

Finally, a topic that has also become a very important one at the Austrian Academy of Sciences – namely, young science – will be debated with Michael Drmota as chair. Michael Drmota is a member of our academy and Dean of the Faculty of Mathematics and Geoinformation at the Technical University of Vienna.

PANEL 1

A FULLY FUNCTIONING LANGUAGE INSIDE THE EU: AN EMPHASIS ON DEVELOPING ACADEMIC AND TECHNICAL LANGUAGE

Chair:

Andreja Žele, SASA

Panellists:

Dušan Gálik, SAS

Nicole Dołowy-Rybińska, PAN

Katalin É. Kiss, HAS

Martin Prošek, CAS

Stefan Michael Newerkla, OeAW

ANDREJA ŽELE

A fully functional language is one involved in all the vital areas of human activity: the public role and use of language; the language landscape; the media; basic computer applications; information communication and so on; bureaucratic and legal language; and language at all levels of education and research. Education involves developing academic and technical language. Developing this terminology in every field is an essential element of every modern language. Advancing the disciplines of translation and lexicography is also crucial to the flourishing of multilingualism and the full functioning of a given language.

How do interventions in the full functioning of languages manifest in individual countries? What are the standpoints of the ministries and government services responsible for these interventions, including legislation on national language policy? How do you evaluate language strategy in your own country? In which areas of society is the impact of language globalisation most drastic? How would you evaluate the status of a national language in education and research, considering the specific

characteristics of the humanities, social sciences, natural sciences, and engineering disciplines? What is the national language use situation at your own institutions of higher education? And which language guidelines do you think are effective and feasible?

One of the basic questions for Slovenia is how to preserve and develop terminology across all areas of our professional and academic activities. In Slovenia, there are at least two vital areas in which the impact of language globalisation is more drastic. These are the language landscape and higher education.

DUŠAN GÁLIK

In Slovakia we have had a law on the state language since 1995. This specifies the rules for using the state language in official communication, in education, in public relations, in juridical and administrative proceedings. There is also an act on the use of the languages of national minorities, adopted in 1999, which lays down rules for the use and protection of the languages of minorities living in Slovakia. I would like to come back later with some remarks

on the use of the Slovak language in academia.

NICOLE DOŁOWY-RYBIŃSKA

My research concerns minority and minoritised languages around Europe. I am investigating, among other things, what makes people change their chosen language in favour of another, stronger one, and what conditions are required for people to use their mother tongue even if this is not the best choice for their career. Recently, I also began to be interested in how English as a lingua franca changes people's language practices: how it facilitates intercultural communication, but also how it limits it. If we take into account all the factors that might weaken a given language, we can see that many of our national languages today are in fact endangered, even though we do not think of them in such terms. This is because they are gradually losing ground to stronger languages, and are being used less and less in different areas of life; one of which is science and education.

The European Union has its own language policy. On the one hand, on the discursive level, language

diversity is supported and appreciated. You can use the language of any European state on an official level. On the other hand, however, English dominates as the language of business, politics, bureaucracy and research, among other things. As researchers, we know that any language is only safe and fully functional if it is used in all possible areas of both private and public life: in the workplace, in courts and offices, for bureaucracy, in schools and education. It is also important that a national system of education should facilitate the best possible start in life for its people. Obviously, we cannot imagine today's globalised world, where people are in constant movement, without a lingua franca. Today this role is played by English. How can the State meet this twofold challenge: securing the national language or languages on the one hand, and, on the other, not disadvantaging children, its future citizens, by limiting their education to national languages alone?

There are approximately 38 million Polish citizens, most of whom have Polish as their first language. There is also a fairly large Polish-speaking diaspora. The estimate is that about 45 to 49 million people have

Polish as their first language. This seems like a lot. However, it is not that much when compared to other, more widespread languages. Polish is the official language in Poland, and it is protected by the Act on the Polish Language, which was voted into law in 1999. Even if official protection of Polish is relatively recent, there is considerable criticism of the law on the Polish language. Firstly, Polish is the primary language of Poland, the language of the public media, the language of public institutions, schools, and churches. There are exceptions concerning national and ethnic minorities, who have the right to have their education and media in their own minority languages and who can use them in public life. This right is based on the European Charter for Regional or Minority Languages and the Polish Act on National and Ethnic Minorities and on the Regional Language (2005). The Act on the Polish Language was created by the Polish Language Council, which safeguards the correct forms of Polish and develops and investigates methodologies for teaching the Polish language.

There have been several amendments to the Act on the Polish Language since its creation in 1999. In some

spheres, this rule has been altered in favour of other languages, particularly English. The most significant of these is higher education and research, where there is no longer any obligation or recommendation that Polish should be used. I cannot present the precise data on language use in higher education because these do not exist in Poland. It is, however, indisputable that there are an increasing number of English-language degree courses in Poland. These courses are supported by the Polish government and by the Ministry of Science and Higher Education; which is understandable, because we rely on students from abroad coming to Poland, and most of these do not speak Polish. What has changed in recent years is that students coming to Poland are no longer expected to learn Polish to any extent, unless they wish to do so.

The situation becomes even more complicated when we consider research. Here, as Andreja Žele said, we need to distinguish between the sciences and the humanities. The sciences are run almost entirely in English. Scientists say that English is the only language in which science can be done, and that they rely on international cooperation, which re-

quires the use of the common language: English. They also claim that all scientific terminology should be in English only, so as to share data easily and avoid confusing other researchers. What is interesting, from the viewpoint of someone working on languages and language ideologies, is that there are fewer and fewer scientific journals published in Polish, and those that do still exist are not scored highly in Poland and do not count towards the individual careers of scientists. This is why scientific vocabulary in Polish is becoming ever more impoverished.

The humanities are not only about the production of knowledge. They also play a crucial role in developing language and keeping the culture of language on a high level, and they are essential to the cultural level of a country's citizens. However, the use of Polish in the humanities is also not supported by the Ministry of Science and Higher Education. On the contrary, it is devalued. Polish researchers are discouraged from publishing in Polish and Polish-language journals. Even those high-value Polish journals that are important to Polish culture and are read by people interested in Poland all over the world are less valued,

on the scientific market, than any English-language journal published abroad, even a low-ranking one.

I agree that publishing in English is also important for researchers in the humanities. However, as humanists, we should keep in mind that if we publish only in English, the Polish language – and this applies to most other state languages concerned here too – becomes poorer. That would be regrettable, for the sake of the language itself but also for the humanities, because our choice of language influences the perspective of our research.

To sum up, I think that education should be at least bilingual, so as to combine protecting the national language with giving children and young people the opportunity to participate in the global market. I believe, however, that the process of weakening national languages cannot be stopped without conscious education about the role of languages and the recognition of multilingualism and language diversity as a common goal and something that should be protected. There is no place for Polish in a monolingual world. However, in a multilingual world where all languages are fully functional, there is a place for Polish,

for German, for Slovak, and for other small languages.

As researchers and humanists, we should publish in different languages – in our national one, and in English – to make the results of our research visible and enable them to be discussed all over the world.

ANDREJA ŽELE

A 2017 national online survey, which was part of a research project on the language policy of the Republic of Slovenia and its users, shows that the vast majority of language users (about 96%) express the opinion that, in the linguistic landscape of Slovenia, there should be more Slovenian than there actually is. An analysis of selected parts of the Slovenian capital Ljubljana showed that, in one of the central streets, the current law is potentially broken by up to 31% of public signs, notices, and so on. Regarding the Slovenian language in higher education, the same survey showed that 58% of lecture content is delivered in Slovenian. At the same time, 83% of the students have no influence over whether they have lectures in Slovenian or English. We can conclude that a large proportion

of higher education teachers are not sufficiently aware that it is important for the development of academic thought in Slovenia that all content be delivered in Slovenian *as well as* English.

51% of Slovenian researchers write mainly in English, 36% in Slovenian, 12% in other languages and 1% in German, while, in Slovenian speaking areas in neighbouring countries, 42% of articles are written in Slovenian. Slovenian employers, for instance, cannot expect a high level of knowledge of Slovenian from those in low-skilled jobs. Staff shortages mean that language standards are voluntarily lowered in professional areas in which decent Slovenian skills are highly necessary: for instance, healthcare. Before Slovenia joined the EU, there was a modest increase in original academic articles published in Slovenian. After Slovenia became a member, that number fell. Today, the number of academic articles published in Slovenian is similar to that twenty years ago, while original academic articles in English have increased threefold between 1995 and 2015; and the number of English articles compared to Slovenian is only rising.

Shortly after the Republic of Slovenia became an independent state, Slovenian was replaced by English as the leading academic language, while other foreign languages remained at a relatively insignificant level. With my students, I have analysed various types of texts – academic, popular scientific, professional – with reference to the subject grammar of academic and professional language. We found that more specialised texts in areas such as engineering, computing, pharmaceuticals, astronomy, architecture, and photography are only written in foreign languages. Academic Slovenian becomes nothing more than a translation language. Some younger or still evolving fields, such as biofuels or robotics, have no chance of developing in Slovenian. The entire typological range of academic, popular scientific and professional texts is in English. More practical, professional Slovenian is still alive, but academic Slovenian is increasingly fading. Which language guidelines seem effective and realisable? One concrete proposal to improve the status of Slovenian in higher education was first put forward fifty years ago: including academic and professional Slovenian as a higher education subject within faculties.

This would encourage more cooperation between teachers from different fields. Such cooperation is necessary for any progress to be made in the development of academic Slovenian.

It would also contribute to mutual understanding and the harmonisation of viewpoints on using Slovenian terminology. This is equally true for the international arena. Users believe priority should be given to three kinds of infrastructure: firstly, interlingual dictionaries and databases for specific language combinations; secondly, terminological dictionaries, databases, and portals; and, thirdly, bilingual corpora of texts or translations. Publication of university textbooks and academic monographs in Slovenian should be encouraged. The continuing development of academic repositories, which keep authors informed about their reception of their publications, is also necessary. In parallel with the above, there is a need to regulate the practice of translation and interpreting, which is still inadequate in Slovenia.

STEFAN MICHAEL NEWERKLA

This is a déjà vu experience for me. We have been discussing this issue

for over twenty years – and here we are again. And now we hear that Polish is also threatened by English; this is surprising. Some twenty years ago, we were already facing a similar situation in Austria. In 2008, we developed a language education policy profile, where we addressed the role of English and the necessity of multilingualism. The Ministry of Education and Science developed a multilingualism curriculum which fostered multilingualism in Austria. We have the Council of Europe's initiative on languages in education and languages for education. Awareness of the importance of multilingualism has been improving. On an individual level, bilingualism and multilingualism are increasing with the upsurge in migration. The situation in Vienna is characterised by multilingualism. However, trends in higher education and research are leading to the deterioration of multilingualism. I second the words of my Polish colleague that regarding scientific journals, even in the humanities Polish as a publication language has decreased although it is spoken by almost 50 million people.

Even in Austria, in our "Wiener Slavistisches Jahrbuch | Vienna Slavic Yearbook", contributions are accept-

ed in German, English and Russian only. Twenty years ago or so, it was still possible to publish in all Slavic languages. This also reflects the way people react to the language situation. As in most member states of the EU, the teaching of English dominates to such an extent that it sometimes seems to be synonymous with foreign language teaching. And what do we do at the universities? We have cut down all courses in languages other than English. In further education, only English language courses can be attended free of charge. Other language courses have to be paid for. Twenty years ago, you could attend courses in any language from Icelandic to Greek.

It is also hard to convince parents of the advantages of multilingualism. Of course, some of them realise that English is not enough. But most parents want the best for their children, and so they primarily foster first-language education in English and forget about the rest. Twenty years ago, English was not obligatory. Now we have it in kindergarten; we have it in the first years of primary school. A few years ago, it was no more than learning nursery rhymes. Today, there is a new trend for marking the children's achieve-

ments in English. This language is so pervasive in our environment, in the international media and so on, that children are faced with English all around them. English is their cultural context. In this situation, we have to think about new measures to foster multilingualism.

My own family is a multilingual family. I speak to my children in German, my wife uses Czech, and we also have other Slavic languages, Hungarian and Italian in our family. But my children use English as if they had never spoken another language, because they watch films in English, and so on. We have problems developing their proficiency in other languages. If we want to send them to Czech language lessons, to Slavic language lessons, they say, "What do I need these languages for?" They no longer regard German as a language of high importance, because they need English if they want to succeed in research. This is the feeling they have; it might not be based in reality. My eldest daughter chose to attend biology classes in English because of a new trend in Austrian schools to teach certain subjects in English. In consequence, talking about animals in Austria becomes difficult, as she does not know the German name for

rarer animals that we do not meet every day. Okay, I hopefully know the German word and she knows the English word and so we can both develop our language competence. Still, is it really best to turn this world into an English-only world?

The situation at the universities is similar. More and more master's level courses are now taught in English, and in English only. This is especially true for the natural sciences, but there are already a number of courses in the humanities as well. Certain modules are in English, and these are proliferating. Some bachelor's programs are *only* taught in English. The argument goes that this is for the sake of internationalisation, so we can attract students from abroad. This goes so far that, as we were told by our colleagues from the Royal Netherlands Academy of Arts and Sciences (KNAW) at the last Joint Academy Day, they teach their own language through English. Old Dutch is taught in English because, they argue, they need to attract people from abroad to study their curricula since student numbers are dropping.

But is it really possible to teach another language, together with its cultural background, using only English? What does the concen-

tration on competence do to the culture and the literature in these languages? In our curricula in education, we observe that there is a trend for ranking competence above everything else. Where is literature education in grammar schools and high schools? While "intercultural competence" has become a buzzword, the reality is that both cultural competencies and literary competencies are lowered for the sake of English language education. I am not against publishing in English; I am not against the English language. I like English literature very much. Still, we need to acknowledge the current situation.

The trend towards monolingualism in higher education is a sad situation. This is especially true for the natural sciences, but there is also an increase of this trend in the humanities. And, for the humanities, this is a detrimental threat. Several laws prescribe the use of German in Austria. We have the ORF public-law broadcaster responsible for enforcing the 2001 Broadcasting Act, which states that all aspects of democratic life are to be made transparent and comprehensible to the public. If you listen to or watch ORF programs, do you realise how much impact English already

has there? Do elderly people really understand those programs?

I am not arguing against English. My plea is to foster multilingualism. How can we achieve this if the public is on course to support English? Parents want it, children want it, my own students do not realise the problem. Younger researchers have been through an English-driven education. They are getting used to publishing in English and do not see the dangers of that development.

KATALIN É. KISS

In Hungary we know well that the loss of a particular function is the first step towards language attrition and language death. Therefore, we try to preserve Hungarian as a language of research and higher education. As for academia, our goal is to be able to discuss and to teach every topic in every branch of research in Hungarian. How can we reach this goal? PhD and DSc dissertations, especially in areas that have few experts in Hungary, can be submitted in English; but they are required to have a detailed Hungarian summary, which hopefully includes the essential terminology in Hungarian. We plan to

establish a terminological center at the Research Institute for Linguistics to develop and maintain a publicly accessible, ever-increasing Hungarian terminological database. Efforts must be made to preserve the publishing of Hungarian scientific books and university textbooks, and to preserve Hungarian scientific journals in every field.

As regards higher education, universities are obliged to offer 10% of the courses within their programs in English. Erasmus students can choose from among these courses. There are entire university programs in English and German – for example, at the medical schools, and at the University of Veterinary Medicine – but these are offered to non-Hungarian citizens. Hungarian students who want to study in English go abroad. What endangers the position of Hungarian in education is the fact that parents are aware that a good knowledge of English increases the value of an individual on the labour market; therefore, they want to send their children to English or American universities. In order to prepare them for an English university, they send them to an English-language high school; to prepare them for an English high school, they send them to

an English-language primary school; and to prepare them for an English primary school, they begin with an English nursery. Teaching English more efficiently in state schools could potentially lower the demand for English-language schooling.

As for the official standpoints on these issues, linguists have convinced the government that legal prohibitions and sanctions are not appropriate means of restricting the use of English. We have a law penalising the sole use of English in commercial signs and inscriptions, but it cannot be enforced. We believe that the use of Hungarian should be promoted by positive provisions.

The Hungarian government – as well as linguists and, presumably, the majority of the public – believe that the Hungarian language is not particularly endangered in Hungary. It is endangered in the neighbouring countries, where Hungarian is a minority language. The Slovak language law penalises the use of Hungarian in the public sphere. It threatens those who use Hungarian – which is, incidentally, an official EU language – in public situations with a fine of 5,000 euros. This law is not at present enforced, but it discourages Slovak citizens of Hungarian descent

from using their mother tongue. We believe that linguistic rights are part of basic human rights. Every human individual is entitled to choose and practice his or her mother tongue freely, and to be educated in his/her mother tongue. We must not only protect the languages of the national majorities of the member countries of the European Union; we must protect the languages of all autochthonous linguistic groups, whether they are majorities or minorities in a given country. We might live to see a federal Europe where we all will be national minorities, and then all of our languages will need that protection.

A language is viewed as fully functioning if all information is accessible in that language. The best means of protecting linguistic diversity in the EU is to support computer translation and other language technologies.

MARTIN PROŠEK

I am here as a representative of the Czech Language Institute of the Czech Academy of Sciences. What we have heard is alarming. The moment has come to spotlight a more optimistic view. I agree with most of the facts

presented here. The situation in the Czech Republic is similar. We live in a globalised society. We have multi-lingual issues. We have communities of foreign workers, scientists and ethnic groups who live in the Czech Republic, who expose themselves to Czech as little as possible and stick together in small groups without needing to learn Czech. Writing PhD dissertations and other scientific contributions in English is in fashion as a tool to secure better career prospects. My country has no language law, and the Czech people have no desire to create such a law. State control of language is kept at an absolute minimum. Czech as a national or state language is handed down by tradition and cultural respect alone.

Traditionally, an important role in this cultural respect has been played by the Czech Language Institute which, for historical reasons, has always compiled dictionaries and a language codification that is respected throughout the country. Even though this codification is not enforced by law, it is widely honoured. We value this, as a Czech Language Institute, and, consistently and in the long term, we foster good relations between the Czech Language Institute and language users in promoting

the Czech language. My experience is somewhat more positive than that of my colleagues. I have been working at the Czech Language Institute for fifteen years and have been active in the counselling service of the Institute, which is the only institution in the Czech Republic in constant contact with language users. Public interest in the Czech language is still high. Czech language as a topic is prevalent in the media. Even minor promotional broadcasts about language are very popular.

However, younger generations are growing up in a globalised world. Even in my own family, I observe that we do not all share the same values and attitudes towards language. My thirteen-year-old daughter is a typical representative of her generation. She likes to watch English videos, read English books, see English films, et cetera. When she enters the higher education system, she will probably, like other representatives of her generation, be exposed to both Czech and English sources. And she will compile her knowledge from both sources. I sincerely hope that, later, I will see the success of my efforts to foster multilingualism. I expect her Czech will be not merely an instrument to enable understanding, but

something she will value later on in life.

We at the Czech Language Institute do not think that imposing rules to stimulate the use of the Czech language would work. Rather, we promote Czech as a national language by pointing out interesting issues associated with language, its history and its contemporary development, its interface with English and other languages; and by pointing out what is typical for Czech, what has been influenced by other languages, etcetera. In my opinion, the only way out of this problem is to promote multilingualism.

ANDREJA ŽELE

Thank you all for your statements. Allow me to ask two somewhat provocative questions: Firstly, is national terminology within the EU still essential and, if so, how might these individual terminologies be preserved or developed within their respective languages? And secondly, how might we compare the national sciences – for example, literary studies, history and so on – with the natural sciences in terms of scientific relevance?

DUŠAN GÁLIK

At the start of the discussion, I was not clear how we would proceed. My field is the philosophy of science and my focus is on the theory of evolution. Now, I would like to place this debate about our languages in a more general framework. Today, about 7,000 languages exist on our planet. However, 95% of all humans speak one of 400 languages. Languages are vanishing at the same rate as biological species. In twenty or forty years, over 25% of our contemporary languages will have disappeared from the face of Earth. One point of this debate is the question: Will our languages survive? From a long-term perspective, no, they will not. Our languages, our cultures will vanish. And it is our task to do everything we can to slow down this process as much as possible.

I will now come to your question and to the main topic, which is the problem of national languages in science and research. In this respect, I will use the term “science” not only for the natural sciences, but in a broader sense that includes the social sciences and humanities. We face different problems in the natural sciences than in these subjects. In the natural

sciences and engineering sciences, as my fellow panel members have mentioned, it seems reasonable that our researchers publish mainly in English. The environment of contemporary science is such that, if they do not publish in English, they are not visible within the scientific community. They are not able to create a national-language community that will be competitive enough to be visible internationally. Social sciences and humanities – our disciplines, the disciplines that deal with our own culture, with our own society, with our own language – face different problems. How can we conduct our research (where our duty is to explore our own cultures and make our findings accessible not only to our colleagues, but also to the general public) while still being visible to researchers from other countries?

Another important aspect concerns evaluation criteria. Not only in social sciences and humanities, but also in the natural sciences. The rules are predominantly established by our colleagues from what are called the “strong disciplines”. There is also pressure on the social sciences and humanities to adopt these criteria, which means, among other things, publishing in English (or another

world language) to make that research visible so it can be evaluated by international as well as national criteria, and so be acceptable in an international context. And this requirement is correct. On the other hand, we need to publish in our national language. Our task is to set a reasonable ratio between publishing in the national language and in English, or another world language. We face this problem again and again.

I would like to tell you a brief story about our own journal. Our academy publishes various journals, especially in the natural sciences and engineering sciences. Many of these were originally published in the Slovak language, thirty years ago. Today, most of them are published in English. Our researchers rarely publish in these journals if they are not rated high enough in international journal rankings, since they are urged to publish in high-quality journals and especially in international journals.

Back to the story about our own journal. In 1994, we created a new philosophy journal, *Organon F*, devoted to analytic philosophy, with the aim of bringing analytic philosophy into the Slovak and Czech philosophical community (the two languages are very similar). When the journal was

launched, the idea was that, after some time, it would also publish articles in English. It was a very successful journal. Two or three years ago, this journal was in the top quarter of the best journals in philosophy according to the SCImago journal ratings list. Then my colleagues decided that, from 2016 onwards, the journal would publish only in English. What happened then? After two years, it had dropped considerably in SCImago. Why? To my eye, the reason is very simple. The journal lost its audience in the Czech Republic and the Slovak Republic. We have to be very careful when bringing our research to an international audience. Let us not forget that we have our own audiences in our own countries.

NICOLE DOŁOWY-RYBIŃSKA

I would like to comment on the statements that it is natural to use English in science or that we cannot impose the use of the national language on citizens. This is exactly how language ideologies function. A language ideology is a set of beliefs about the language, about the users of the language, about its functionality. Those beliefs are so deeply internalised in

peoples' minds that they become naturalised. We no longer perceive them as a construct.

Back to your question. Yes, terminology in all languages is important if we want to keep those languages functional. Many sociolinguistic studies on language loss show what happens when a language is not used in domains like science. The decision not to do research in a given national language is a first step towards language loss. After that, the process goes quickly. I agree that protecting a language by enforcing its use by citizens is a questionable method. Yet this is a question about language ideologies. The English language is imposed on us through the economy and relations of power. However, we do not see that this is the same mechanism that we refuse to consider when talking about our national languages. This is because we believe that English is the language that should be used, because it is the language of the globalised world. It is the language of prestige. It is the language we need to have in order to become part of this world.

I would like to emphasise how important it is to be aware of the social mechanisms of language choice and use. This awareness is necessary to

actively protect languages we do not want to lose.

STEFAN MICHAEL NEWERKLA

A fully functioning language might be harder to preserve than we previously thought. For Lower Sorbian, for example, there is a terminology commission who developed an academic and technical terminology, but no-one uses the language anymore. You have dictionaries and you have the terminology but, if people do not use it, there is nothing to be done. In our situation, we should be attaching prestige to other languages as well. We cannot fight English; that is impossible. But we can attach positive prestige to other languages. We believe that we can be visible globally only if we use English, but that is not true. Here in Central Europe, we need other languages to comprehend history, to grasp culture, to gain understanding. Still, we believe that we need English to be visible. Where do we want to be visible? Who will read a scholarly paper about the Czech language in South America, for example? Anyone interested in such a publication is most likely able to read and write Czech. Why do we have

funding bodies supporting research projects on the German language where the regulations state that, in the context of the application and hearings, everyone active in those projects must communicate about them in English? Any expert able to draft an expert review or prepare an evaluation of such a project has to be able to write and speak German, otherwise she or he is not an expert in this language. So why do that in English? Can anyone explain that?

The same is true for Czech. For any significant evaluation in the natural sciences, the projects are formulated in English, the technical language is English. It's a different story in the philologies. For example, at the Czech Language Institute of the Czech Academy of Sciences, they also did these things in English at first. But then CAS President Eva Zažímalová allowed us to give our talks in Czech. All panel experts were able to do that. The researchers from the institute were happy about this, and we were, too. If that had not happened, we would have spoken in English, as we are doing here. We can attach prestige and power to languages.

We have several evaluation committees at the University of Vienna. Al-

most everybody speaks and understands German. Yet whenever there is the slightest hint that someone perhaps does not speak German that well, we all switch to – mostly bad – English.

Perhaps it would be better to be open to the multilingual practice of code-switching. Just like people communicating on street corners, we could use several languages in the same conversation. My argument is not about proficiency in each and every language, but about the practice of speaking several languages simultaneously. If a native speaker of English and a native speaker of German communicate, it is no problem if each speaks their own language, assuming they understand the language of the other. We don't all have to speak English. Sometimes people are happy to hear some German. Often, experts from the US, Canada or the United Kingdom like to use their German, as well.

AUDIENCE SPEAKER 1

We, too, are horrified about what is happening to our language, how badly it is taught in schools and how we have young people in America

who are no longer functionally literate in English. And we complain about it a lot. One of our problems is where this is taught. Is it the responsibility of an English department at a university? Most of our universities have gone on to teaching what they call “freshman writing” across the spectrum. So we have to teach it. I am a Classicist, in Classics, but we teach it in texts and translation. We teach people about subject-verb agreement and that kind of thing. I have a sense that this is not happening at the University of Vienna. It is delegated down to the schools. I have been wondering what the impact of that is on the feeling for German as the native language. Also, to what extent do you have literary writers, creative artists, or poets in your language departments? We have that in England and in America; we teach creative writing and film. In my eyes, the creative world has a huge impact on the spreading of language and culture. I would be curious to hear about how that works in the departments of Slovenian literature or Hungarian literature.

AUDIENCE SPEAKER 2

Two things were missing, at least in my understanding. One, I heard so much about visibility. This is a very introspective, academic perspective. When medical scientists meet, they talk about finding a cure – for instance, for cancer – and quickly. In my opinion, at least, it is extremely helpful that those people spend little time negotiating which language they should use to, for example, get to a basic understanding on their laboratory research. I thought it would be interesting to tackle this issue: how to combine crucial issues of communication. This is what science is about. In another panel, they are talking about the world climate. How on earth can we talk about the climate if we first spend hours debating which language to choose? My wording is a bit polemical because I feel this was missing from the discussion. I think it is not all about the humanities. We should not put our own precious languages first. We have had that debate, as some of you mentioned, for thirty years, since I was in school. Rather, I think it is about why science matters. I think it is detrimental to the humanities to leave out the question of why science matters, be-

cause then they leave this field to the natural sciences.

Also – I am aware that the situation is very different in Hungary or in Slovakia – but in Austria, for instance, the burning issue is not so much about German and English in schools but rather about Turkish and Arabic and Serbian and German. This is another layer I would have liked to hear a little bit more about. Primary education, secondary education and university: these are all interconnected systems, but we address different things, and I would have liked more structure in addressing these things.

AUDIENCE SPEAKER 3

I am a political scientist. I would like to continue where my colleague left off. I was frustrated by the very pessimistic picture you were painting. Some pragmatism seems necessary when it comes to languages. As the previous speaker just said, we need something to communicate about. In the past, Latin was the communication language for the sciences. This did not prevent the emergence of national languages. So why not just cool down?

Nevertheless, it was common sense that the sciences need a common language. Then you all spoke about the need to maintain the national languages and to create a feeling of respect. I agree with that. I also speak five languages; I love to speak in different languages. Two remarks. Firstly, translation: Umberto Eco said that the European common language is translation. Translation and interpreting are a matter of money. If we want to speak in our own languages, we need an infrastructure that allows for that. And we have to finance that infrastructure. Secondly, the place to do that is the European Parliament. Few in the European Parliament speak English and now, with Brexit, that number is getting even lower. So why not promote translation and interpreting and advocate financing of the necessary resources?

AUDIENCE SPEAKER 4

I am from the Academy and from the University here in Vienna. In my own research, I claimed that the first sign of the decay of a language is the disuse of productive word formation of the indigenous language. And I discovered that this has been true for

the Celtic language, Proto, since the First World War, but that Slovenian and Croatian as minority languages in Austria are not decaying, although unfortunately the number of speakers is decreasing. What my colleague Stefan Newerkla said is very significant. It is not just about creating, but also about using. And therefore I appeal to the present president of the humanities section in my Academy, Oliver Schmitt, because I'm very unhappy that, in the official communication of the Academy – as well as for many offices and departments at the university – only the English title is used and not the German. This would be a small contribution to having more respect for the German terminology.

AUDIENCE SPEAKER 5

I am from Hungary. I have five small remarks. To start on an optimistic note, we will live to see the day when mobile phones interpret speech directly into our ears. I am old enough, but I hope to live to see the day. It will help a lot of languages to remain available to us, as they are primarily in writing today. Then we have to be aware that there is pressure from var-

ious sides. There is pressure on the universities to go international, not only as a business consideration, but also with an eye to rankings. How international a university's student population is counts towards that university's international rankings. And if we have an international student population, then English will be the lingua franca. Then we have the pressure regarding publications, as some of you have noted. You have to count up your references. If you publish in a small language, your chance of having many references decreases. So you have to publish in an international language, and our international language is English. The third pressure is on research communities. I have been director of a research institute for fifteen years, and my purpose was to internationalise my research. When I hired international researchers, the language changed to English. If you want an international community, you choose between Hungarian and English. Does everybody speak Hungarian? No, and so the discussion continues in English. Finally, terminology changes very, very quickly. Do we have to bother translating it? Some terminology that has been with us for many years has not been translated, terms like tran-

sistor, like laser, like radar – we all know these terms without translation. So the translation of terminology is necessary for the school system, but unnecessary for the university system, and especially at the level of research.

AUDIENCE SPEAKER 6

I have been teaching anglophone literatures as a non-native speaker for forty-five years. Today, it is mandatory to publish everything in the field in English, though that is a generational issue. My English teacher preferred to teach literature in German, for the subtlety of his interpretation. And there is a case to be made for that. So although – and I recall the meeting we had a year ago, when our colleague from the Netherlands suggested that she was expected to teach Dutch literature in English to attract foreign students, the national literatures should be taught in the national language – it is also a question of defending culture. To bring in one example, in Canada, Québec, the Loi 101 was introduced to defend the French language against the dominance of the anglophone cultures in North America. There were several

disadvantages and problems with this, but at least the effort was made. Also, Erasmus and Socrates programmes. When we send our students abroad to countries where English is not the main language of instruction, they should be exposed to that language, and there should be money provided for education by immersion in other European languages. Our discussion here is not restricted to the recent newcomers, but to the established languages surrounding Austria, in Central Europe. On translation: I visited Corsica this summer. I was shocked by the quality of German translation for tourists. I was appalled. The translation of the French text into English and Italian was okay, but the German was dreadful; it made little sense. Attention ought to be paid to such issues, and prizes should be awarded for good quality translations, including through the European Union.

ANDREJA ŽELE

So we have established that translating and interpreting are very important and have a crucial role. Would you please comment on translation and interpreting?

DUŠAN GÁLIK

Allow me a personal remark dating from the 1990s, when the world became open to our countries; which also meant that it became open to some of our disciplines, especially the social sciences and humanities. At the time, we faced the challenge of translating modern theories in philosophy of mind and cognitive science, for example, which at the time were new in the sphere of philosophy. We realised that we did not have terms in the Slovak language for this. It was hard work to identify new terms in Slovak or to interpret English words into the Slovak language. Translation is important, not only from the point of view of bringing new knowledge to your own national culture, but also from the point of view of further developing the national language. Allow me to return to the issue of Latin. How many scientific works were published in other languages than Latin in Europe? The situation was different. In the humanities and the social sciences, again, yes, we also have to publish in English because we want to cooperate. We want to understand each other. We want to know what researchers in Slovenia, in Bulgaria, in other countries are do-

ing. Do you know what the problem is? The problem is that many of our researchers refuse to publish in English. That is our problem.

NICOLE DOŁOWY-RYBIŃSKA

One more thing about translation. Translation is crucial, and I agree with my colleague that it is possible to have multilingual conversations without any problem – if we have the tools for it, such as passive knowledge of a language, or translation. If decision-makers were to give more attention to translations, it would probably be feasible to achieve an interpreting technology that would facilitate bilingual conversation within a few years. However, these are pragmatic decisions. When English is the common language for all, interpreting is not necessary. If decisions are made on a purely pragmatic basis, no other languages besides English would be left, whether we agree or try to prevent this outcome. I don't mean there should be no research done in English. But if we don't also create opportunities for other languages to be used, the linguistic situation of the world will change irrevocably. If we want the

world to be monolingual, we can agree to do everything in English and “stop wasting time and money”. But if the environment is important, if cultures are important, if diversity is important, languages are the most important factor in protecting all of these. How can we protect the climate if we do not protect the people who are part of this world, along with their languages? If we think only in pragmatic terms, we might lose everything.

MARTIN PROŠEK

I would like to make a side comment. As a Prague structuralist, I would like to point out that we confused a few things when talking about academic language. We were talking about technical terminology and about terminology for the natural sciences, which is something different. We do not mean language as a whole by that. Rather, we are focusing on the lexis. So the question is whether we are talking about terminology, or language in its entirety, or about losing one communication domain. When answering the question, let us also bear in mind that, from the point of view of the Prague school of linguistics,

language should not be pushed into functions where it is not needed or welcome.

I cannot imagine myself telling natural scientists to develop a national terminology. When they use their national language to communicate in their laboratories, they use grammatically perfect Czech while much of the terminology or slang is taken from English. Their communication in the workplace is perfectly adequate for that particular working environment. Sometimes problems arise when natural scientists need to publish a paper in English, because their proficiency might not be as good as they would like, but that is a different aspect of our problem.

We must distinguish when to promote terminology, when the language as a whole and when language within one particular communication domain, and so on.

CONCLUSION ANDREJA ŽELE

Our panel has presented the current situation in language planning within the Czech, German, Hungarian, Polish, Slovak, and Slovenian languages. The members of the panel are

facing different problems and so they have different viewpoints and solutions. Our report collects those different experiences and concepts. On this basis, we can develop a coherent common strategy in the future.

To obtain up-to-date information about the current state of language policy in the individual countries, we could perform a national online survey every few years. The main objective would be to inventory the needs of different groups of language users. For example, both specialised and general language users should be invited to participate. The project should be carried out by researchers and experts with a good knowledge of different areas of public life in each individual country, but also of the life of national language communities outside the country. Legal experts also play an important role. The project could be presented as a comprehensive attempt at the active integration of language users to the widest possible extent in developing future language policies.

National terminology in the natural sciences, in technical fields, the social sciences, and the humanities cannot appear of its own accord. The primary responsibility for its establishment and clear definition must lie with ed-

ucators in higher education and with researchers.

We contend that the areas of language education and language infrastructure should be developed in parallel and receive equal financial support.

We need to encourage the publication of university textbooks and academic monographs in national languages.

The continuing development of academic repositories to keep authors informed about the reception of their publications is also necessary. In parallel with the above, there is a need to revise the practice of translation and interpreting, which still leaves room for improvement.

One of our main conclusions is that, for further academic work in this area, it is essential to work on preserving and widening academic thought in each individual language. I would like to thank the organisers on behalf of the panellists.

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DUŠAN GÁLIK, *Vice President for International Relations of the Slovak Academy of Sciences.*

NICOLE DOŁOWY-RYBIŃSKA, *Assistant Professor at the Institute of Slavic Studies of the Polish Academy of Sciences.*

KATALIN É. KISS, *Senior Researcher at the Research Institute for Linguistics at the Hungarian Academy of Sciences.*

MARTIN PROŠEK, *Director of the Czech Language Institute of the Czech Academy of Sciences.*

STEFAN MICHAEL NEWERKLA, *Professor of Slavic Linguistics at the Department of Slavonic Studies at the University of Vienna and the Austrian Academy of Sciences.*

PANEL 2

IMPLICATIONS OF CLIMATE CHANGE WITH REGARD TO WATER SUPPLY AND RELATED ISSUES

Chair:

Václav Šípek, CAS

Panellists:

Paweł Rowiński, PAN

Franci Gabrovšek, HAS

János Józsa, HAS

Pavol Nejedlík, SAS

Günter Blöschl, OeAW

VÁCLAV ŠÍPEK

The paradigm that posits unlimited water resources in Central Europe is no longer valid. Research suggests that increasing or decreasing amounts of water will be available, or that the water supply will be distributed differently throughout the cycle of seasons. This will have implications for a number of activities within human society, and for different aspects of the economy. The quantity of available water is decreasing, but water quality will also be affected. There will be less water in the streams, so the dilution and dispersion of pollutants in water will be less effective. The water temperature will rise, which will affect the breakdown of pollutants in rivers.

To start, I will ask the panel members to briefly outline problems of water availability and the changes we can expect.

JÁNOS JÓZSA

Let us limit our discussion to water supply and climate change. Today, we tend to view that problem in an integrated way. While the availability of water is strongly linked to geogra-

phy, the land use of a region – what is called “throughput” – also plays a key role. How efficiently materials are used is important. Looking at the water supply alone is not enough. We also need to safeguard water quality by preserving or even improving the quality of natural environments, and so on.

I have more than one perspective, and this is my fate. I am a hydraulic engineer. I am rector of a university. I am head of the National Water Science programme, which is linked to the Academy of Sciences. I consider international implications and look at the general picture. Water supply cannot be separated from the surplus of water: flooding. We need to think about the hydrological cycle in its entirety. Water supply is just part of the story. At the extreme end of the scale, the recent and still ongoing phenomenon in Venice is a brilliant example of unfortunate correlations. You may have come across it.

VÁCLAV ŠÍPEK

What kind of correlations?

JÁNOS JÓZSA

That much water cannot simply be understood as Venice’s water supply. It is much more than that. The extremes also affect the worst days of water deficits, when we are facing droughts.

A few words about mathematical evaluation. We lack suitable statistical or analytical tools, so we need to develop novel techniques and approaches in statistics, and probability calculations, and so on. For some phenomena, we are not even able to determine whether they are stochastic, deterministic, fuzzy, or chaotic. They might be deterministic if we look at the results, but our detailed knowledge about the parameter distribution might be fuzzy. The system in its entirety is driven by stochastic boundary conditions.

GÜNTER BLÖSCHL

Climate change and water has been my research subject for twenty years, both within Austria and at the European level. From a water resources perspective, two effects are significant. Firstly, storms approaching Europe from North America across

the Atlantic tend to be further north than in the past. In consequence, northern Europe receives more water while the south of Europe receives less water. The Mediterranean is strongly affected by droughts. But, in the north of Europe, we have more water than we used to have. Flooding has increased, particularly in the British Isles, on the west coast of Scandinavia, in northern France and in Denmark. So wet weather systems are further north, which changes the regional distribution of water in Europe. Secondly, because of higher temperatures and better availability of energy, evaporation has increased ... a lot. Water balance studies in Austria have shown that annual evaporation has risen by 80 millimetres per year over the past thirty years. The average precipitation in Austria is 1,100 millimetres per year. Now we have an extra evaporation of 80 millimetres – an increase of 17% over the past thirty years. That is a huge amount. Precipitation in Austria has increased by approximately the same amount over the past decades. On average, the runoff is similar to what it used to be 30 to 50 years ago. We expect this trend of increasing evaporation to continue. There is more rainfall in the

north of Europe, particularly in the winter, and less rainfall in the south of Europe. It is less likely that precipitation will increase to the extent we experienced in the past decade, so we must expect a shortfall of water in the centre of Europe, but with a very strong north/south contrast.

PAVOL NEJEDLÍK

Climate change has arrived in all regions. The impact is not the same everywhere. As Professor Blöschl has told us, evaporation is increasing throughout the region ... in the lowlands. In the foothills and the mountains, the situation is a different one. There, the gap between potential evapotranspiration and precipitation is not widening as significantly as in the lowlands. At higher altitudes, the parallel increase of precipitation and evaporation and the coefficient of dryness is not noteworthy. The increasing temperature also affects the water cycle in that the snow is disappearing in the lowlands. In consequence, the water supply in spring and early summer is not sufficient – the water has simply run off during the winter. This seasonal effect affects agriculture most

of all. One decisive problem in land use and environmental management concerning water sources and water use stems from agricultural policies in the European Union. Agricultural businesses manage a considerable share of the land from an anthropogenic perspective and have an enormous impact on the world's water cycle.

FRANCI GABROVŠEK

At the Karst Research Institute, I study karst aquifers, carbonate aquifers. Much of our water is drawn from carbonate aquifers, which are extremely vulnerable. About a quarter of the world's population relies on karst water. In Austria and Slovenia, that number is more than 50%. 96% of Vienna water comes from karstic high plateaus, which are vulnerable. Almost the entire Mediterranean region is karstic. There is the problem of seawater being sucked into the water system, contaminating the water supply. As Professor Blöschl mentioned, the Mediterranean region is turning drier. As sea levels rise and sweet water levels in Mediterranean karst aquifers fall, the boundary between saltwater and freshwater will

shift further inland. Islands that have their own water supply might lose that supply.

Another issue in Slovenia, which is also relevant for Vienna, concerns the mountainous areas that supply the region with water. The karst plateaus where water infiltrates are more or less bare. Retention of water strongly depends on snow cover, which is decreasing or disappearing, and, with it, the flushthrough. The Hochschwab springs, for example, have the typical regime of a meltwater spring, with peak discharge in late spring and minimal discharge in winter. The water supply might dwindle along with the snow.

PAWEŁ ROWIŃSKI

When we talk about the implications of climate change concerning the water supply, we should put this in context. We need to stress the interplay between water supply, water availability and water demand. In the early 90s, water demand in Eastern Europe declined – which was surprising. This was a result of the introduction of metering in combination with high water prices, which were new in our countries. Economic

growth in our countries is expected to lead to a reversal of this trend. I would go so far as to say that we will see a massive increase in water demand. Projections for Poland predict that, in 2050, there will be a 70% increase in water demand compared to the 1990s.

Some aspects of the situation in Poland are even more serious than in the rest of Europe. Contrary to popular belief, Poland, which is located at the confluence of ocean and continental climate zones, has never had much water. Poland occupies one of the last places in the EU rankings when it comes to the availability of water resources. The estimate is less than 1,600 cubic metres of water per working habitat and year. That is three times less on average than other European Union countries. What water we have, we do not secure. There are not enough reservoirs. Poland retains only 6.5% of the water that passes through the country. Spain, to take one example, retains nearly 50%.

We also need to remember that 97% of Poland's water comes from precipitation, which is something we cannot predict with accuracy, like changes in temperature. This is fraught with enormous uncertainty.

Much of Poland's rainfall water is lost because it is not collected. Winters are mild and the snow coverage is decreasing, as my colleagues have mentioned. Our high-temperature periods start in spring and last throughout summer. This often results in the water levels of our rivers falling considerably. Last year was a good example: water levels were extremely low. In 2018, water availability dropped almost below the safety margin. In this century and those that follow, water will be the most significant problem for Poland and its economic growth.

VÁCLAV ŠÍPEK

As Professor Blöschl mentioned, Europe will be divided into two zones: one that receives more precipitation than before and one that receives less. In the Czech Republic, we are currently in the middle. Most climate models project that we will, on average, receive the same amount of precipitation as in the last decades. The precipitation pattern will shift slightly to less precipitation during the summer and more precipitation during the winter. Projections predict a gradual and almost homogeneous

increase of temperatures throughout the country, which means that some of the precipitation in winter will be rain rather than snow. As my colleague mentioned with reference to Slovakia, snow cover will decrease, which will affect groundwater levels. One interesting difference to what Professor Blöschl has told us concerns evapotranspiration. We are now experiencing decreasing evapotranspiration in summer, but not in winter. So less water is available for the transpiration of plants. This phenomenon – that water will evaporate more in winter and less in summer – might have an impact on the surface temperature, which will cool down at a slower pace than it historically has. We are facing the problem of changing precipitation patterns, which will lead to changes in the pattern of available water.

Another essential factor is the decrease in the soil's capacity to hold water. This is a result of agricultural practices, which increase bulk density in the soil and decrease the organic matter content of the soil in the fields. So, as the pattern of incoming water is changing, we need to collect it throughout certain periods of the year so that it is available later, in the growing season. Two phenomena are

emerging: changes in the patterns of the available water, and changes in the ability of the soil to hold water. These are problems we must address. Now, I would like to ask the panellists to outline the activities undertaken by local authorities and governments in your countries to address the problems we are facing.

JÁNOS JÓZSA

In my first statement, I mentioned the integral approach. There was some valuable feedback on different aspects of that. Regarding the processes that have been mentioned here, although thermodynamics conditions would be conducive to more evaporation, this is limited by the amount of available water. In Hungary, we decided to change and optimise land use. Geographically, Hungary is also located near that neutral line, with neither an increase nor a decrease. In spite of this, the gap between extremes will widen. There is no overall trend, but variability will increase. We have to change land use in a favourable way. We also have to increase the efficiency, not only of water use, but also of the production of certain materials. To counter the

evaporation problem, for example, the water surface of some reservoirs in the United States is covered with plastic balls. While this is not great from a landscape point of view, it can favourably change the evaporation rate. I do not suggest doing this, but it is something that is done.

The disappearance of snow cover in winter changes the runoff and the formation of floods. It will also lead to changes in agricultural productivity with respect to the water requirements of crops. Adaptations have to be made – crop changes, or at least modifications. Any favourable change of land use is a long process. To increase efficiency, we need to optimise and regulate the use of different materials as a way to control water supply and requirements, both of drinking water and of water used in industry or agriculture. In agriculture, we can save water by introducing micro-irrigation systems.

This problem does not only concern the economy. Social problems must be addressed as well. People are attached to the countryside. This is how they live. We need to help people come to terms with unavoidable changes. Projections exist, perhaps biased ones with errors, but we can quantify those errors to improve our estimates.

GÜNTER BLÖSCHL

Overall, there are three options for dealing with water scarcity. Option number one: introduce new fresh water into the system. In coastal areas this can be achieved by desalinisation, which is expensive and therefore a no-go for irrigation. An alternative is virtual water. Instead of importing water, we import food produced by irrigating somewhere else where water is more plentiful. This is more efficient.

The second option concerns the irregular distribution of water availability in space and time. Our seasonal hydrological regime means that we have more water available in winter than in summer. Geographically, water is distributed irregularly around the world. Only 5% of global water resources are used by humans. And yet water is scarce in many places because of that irregular distribution. What can we do? We can store the water in reservoirs to redistribute it in time. We can transfer water to redistribute it in space. Both approaches are important engineering tools for managing water scarcity. In Austria, for example, networking of water supply systems has improved. Previously, separate regions

had their own individual water supply systems. Today, these systems are interconnected via pipes, which increases the robustness of the general water supply system in case of regional droughts. So redistribution in space and in time is a key approach for managing drought.

Third option: Demand management. We need to reduce our use of water. In Austria, there is little irrigation. Globally, 90% of water consumption by humans is used for irrigation. The global requirements for drinking water are minimal: only 1%. Irrigation of crops for agriculture is the dominant water consumer. In Austria, only 3% of our agricultural fields are irrigated, most of them on the border with Hungary. Most Austrian crops do not need irrigation; this may change. The increase in irrigation requirements is of critical concern. On the one hand, this can be balanced by improving irrigation systems. As János Józsa mentioned, we might use drip rather than sprinkler irrigation as a more efficient irrigation system. With sprinkler irrigation, rotating sprinklers simply spray water onto the fields. The downside is that 50% to 70% of the water evaporates before it can be absorbed by the crop. Drip irrigation introduces the water

locally into the soil. Evaporation losses are much less: only 10 or 20%. On the other hand, water consumption for agriculture can also be reduced by changing the crop type to plants with lower water requirements and higher resistance to rising temperatures, which is important because air temperatures have increased by more than two degrees over the past thirty years – a significant change. Improving irrigation efficiency and changing crop types are the main water management tools for agriculture.

PAVOL NEJEDLÍK

Professor Blöschl has described a situation where agriculture and the economy are doing well. In countries like the Czech Republic and Slovakia, the situation is different. After the end of the socialist era, in the early 1990s, we had roughly 330,000 hectares under irrigation. To do this we consumed roughly 280 million cubic metres of water. Now, we have 50 to 60,000 hectares under irrigation and we consume around 15 million cubic metres: twenty times less. Often, the problem is not that we do not have sufficient resources. We need to trans-

port our water. It is possible to transport gas over four to five thousand kilometres from Siberia, and yet we are unable to build water pipelines of a few tens or hundreds of kilometres. We have done much more for flood protection than for drought management. Flood protection is not perfect, but 90 to 95% of the money invested in water management went into flood protection. Drought management plans will have to be set up, establishing what to do in case of drought and regulating the water distribution priorities in different conditions.

FRANCI GABROVŠEK

In Slovenia, one thing we still need to do is to characterise those carbonate aquifers that are not yet used for the water supply. There are plenty of those. Secondly, all Slovenian water supply companies, which are of course public companies, must submit a backup plan. If their primary source is polluted, drains out, or is compromised in any other way, they must have access to an alternative fresh water source of sufficient quantity and quality to supply the population they are serving. Thirdly, we are facing distribution problems. In

our coastal Mediterranean regions, which are also our tourist regions, water is in short supply during the summer months. There has been intense public and political debate about how to meet the water requirements in those regions. We have been looking for additional water sources. However, the possibility of redistribution from areas with an abundance of water has not been seriously considered. In a small country like ours, pipelines would solve most water quantity problems – for the moment, and probably for some time to come. And the additional characterisation of potential water supply aquifers is necessary to address emerging quality problems.

VÁCLAV ŠÍPEK

Professor Rowiński, is your country taking action to address changes in the water supply?

PAWEŁ ROWIŃSKI

The problem is complex, and my answer has to reflect that. Your question has a significant political aspect. Our debate is about water supply

problems caused by climate change, not just water management issues. In Poland, the first thing we had to do was to convince decision makers that we have a water supply problem. As I have mentioned, we had not been aware of just how scarce water is in Poland. The second problem of which we had to convince our politicians was the reality of climate change. There were heated debates about whether climate change is real or exists only in the imagination of a few scientists. It was a difficult process but, a few days ago, our new Ministry of Climate was established. So perhaps we were successful to some degree.

When explaining water management to people who are not familiar with it, we need to communicate how complex the problem is and how many – often contradictory – problems have to be addressed. We have to battle droughts while fighting floods. At the same time, we need to protect our water sources. There are many environmental demands we have to consider. In modern water management, we tend to adopt a holistic approach. Implementation by decision-makers, however, is a different story. The theory does not reflect what is really being done.

In Poland, we have faced a number of institutional changes in terms of water. In the past, water policy responsibilities were divided among different institutions: ministries, water management authorities, local governments. This was a problematic situation. Recently, the new government established the National Water Agency, which is now responsible for all water management issues. In some respects, it was a good thing to combine these distributed responsibilities into one agency. On the other hand, water management was taken away from the Ministry of Environment in Poland. There is the Ministry of Marine Economy and Inland Navigation, which is a symbolic title. In this sense, inland navigation can be seen as the main driving force for water management. In front of me I have a brand-new environmental implementation review by the European Commission. Its authors point out that significant problems arise if one institution makes decisions on water management issues and another institution is responsible for the state of the environment. So it is an often-contradictory and, at times, difficult debate. However, what has been done in practical terms? New water fees have

been introduced in compliance with the Water Framework Directive. The new taxes include a rain tax, which has never yet worked in Poland. The collection of these taxes, which falls mainly to companies, is difficult. On paper, we have an enormous development program for increasing water retention in Poland. This includes the construction of massive-scale reservoirs, but also the implementation of local retention programs, which is probably even more important when it comes to droughts – a significant problem in Poland’s future. Twenty years ago, there was a drought perhaps every five years. Now, every year brings serious and severe droughts. Many programs are carried out by local governments, especially cities. They develop and implement adaptation plans to safeguard the water supply within their cities against the problems that come with climate change. We have launched a program called “Stop the Drought”, which so far is still mostly debates with stakeholders on how to stop the drought within the environment. While we have not established any details yet, a significant budget has been allocated to this problem. There is considerable uncertainty. New institutions, new regulations, inten-

sive debates between environmental groups and hydraulic engineers who would like to just construct enormous reservoirs. That is the situation in Poland.

VÁCLAV ŠÍPEK

Before I forget, could you explain that rain tax and what is it based on?

PAWEŁ ROWIŃSKI

Buildings with a surface area exceeding 3,500 m² and that are surrounded by concrete are taxed because of their effect on the runoff. The tax is for large-scale concrete infrastructures.

PAVOL NEJEDLÍK

In Slovakia we pay this tax for every roof. Every building made of concrete or covered by materials through which water cannot percolate is taxed, no matter the surface area. I pay for my own roof.

JÁNOS JÓZSA

Some countries legally stipulate that whatever you construct or build, in whatever way you change the land, you have to make sure the same amount of water goes downstream. You can do anything at all, but you cannot change the runoff pattern.

VÁCLAV ŠÍPEK

Did the rain tax have an effect on the area of concrete structures?

PAWEŁ ROWIŃSKI

That is a good question. The rain tax is new and was introduced by a new organisation. According to statistics, it has been collected from 200 communes out of 2,500. The aim is to get the required money into the relevant budget, so it is mostly to get taxes. It shows the need to maintain areas for holding water.

VÁCLAV ŠÍPEK

We have a similar problem. Built-up areas are covering more and more

space, especially around the cities. There is a tax for covering the soil, but it is low and rarely has any effect. In the Czech Republic, water managers are aware that water resources are limited and the situation will get even more serious in future. Our water consumption is low, even lower than the European level, so there is very little potential for reducing water consumption. The discussion is focused on securing new water sources. There are two major groups, one of which is represented by construction engineers, who advocate constructing new dams or other artificial structures in streams. The second group supports more environmentally friendly solutions like improving soil quality, changing the land cover, altering land use in the environment, or regulating agriculture. The two groups are not able to come to an agreement. So the only measure currently being taken is to connect the water supply lines, like in Austria, which is an efficient measure. In those regions not connected to the pipe grid, they are drilling deeper and deeper boreholes in order to extract groundwater.

For the next round of questions: Can the problems the entire region is facing be managed by a single approach?

Do we need to reach a mutual understanding that a number of different things should be done with streams? Do we need to construct a number of dams? Or should we just take care of the landscape?

JÁNOS JÓZSA

We have to make use of Industry 4.0 and other developments to change our water supply systems and their operation into smart systems. The technological development, especially for urban areas, is enormous. We have the tools to introduce powerful, automated control systems. Self-learning systems may cope with some of the future problems. It is much easier to make a city or a town smart. This involves advanced sensorics, advanced analysis, advanced deep learning, artificial intelligence and so on. But, in Hungary, we have also introduced a new digital agriculture project. Technological development will soon enable adaptive approaches. Smart systems will learn from the initial behaviour of a new system and make necessary improvements and changes adaptively. As has been said, we have to deal with several different space and time scales. To

tackle the emerging problems, a comprehensive approach is needed. In Slovenia, only a small portion of our drinking water comes from karst regions. Most of it comes from alluvial rivers. So drinking water is gained by bank-filtered water abstraction, which means that a water particle has to travel 150 days before it is abstracted. It starts from the river, uses a direct link from the surface water as the main supplier to the groundwater, and then it is abstracted. We just launched the big-budget excellence project “From the source to the user”. One aim is to trace the entire process using a holistic approach; another is to examine the efficiency of constructing reservoirs. UNESCO recently developed an overview of river-based reservoirs and found that half their volume is lost by siltation. We have to ask whether it even makes sense to build new reservoirs or dredge existing ones. Spatial distribution is a given, so, if you dredge them, they will of course stay in the same place. We will need new reservoirs in locations where water supply problems are emerging. Still, it is difficult to determine efficient measures. The UNESCO study is helpful. Problems of scale and time frame are also emerging. Our measures need to be

implemented quickly and efficiently to address new problems before they can become alarmingly serious. My view is that new systems should be smart and adaptive, so that they are open to further improvements and adaptive technological upgrades when new problems or phenomena arise.

GÜNTER BLÖSCHL

Unfortunately, the drought management discussion is often polarised between technological solutions versus green solutions. In most cases, the appropriate solution is a portfolio of different measures that balance green solutions with technological and governance ones. Governance is a third option, and it needs attention. A combination of these three pillars usually results in useful and sustainable solutions. The prioritisation of the pillars may change significantly. Sometimes, building a big reservoir is much more efficient than increasing the carbon content of the soil. Typically, the efficiency of green solutions is comparatively low because they have relatively little leverage. With technological solutions, the leverage is high, but you may have to deal with

side effects. Technological solutions are liked by many: not only engineers but also politicians. This is because they are a good way to show your results. How can you demonstrate to your electorate that the soil’s carbon content has increased? A huge dam, on the other hand, is very presentable. A prime example is the south-north water transfer in China. New canals were constructed to connect China’s rainy south to the dry north, including the North China Plain surrounding Beijing. The amount of water transported is roughly 300 m³ per second, which is about one-fifth of the water in the Danube River. So a large amount of water is transported from south to north, with several side effects. The efficiency of this measure, for example, is only 50%. Only half of the water sent to the north actually arrives – because of unlawful water abstractions, because of infiltration, because of evaporation. These are the pros and cons of structural measures. Green measures are usually less efficient. They can be sold mainly to a green electorate. Governance solutions, the third pillar, are also important. Awareness-raising can be a very efficient measure for dealing with droughts. Then there are tradable water rights. In our countries, citi-

zens are traditionally granted water rights. They can extract water from rivers without having to pay for it, but they cannot sell it. Those water rights are granted for long periods, about fifty years. In Australia, where droughts are a major problem, water rights are handled differently. On the one hand, Australia has a “water audit”. Changes in the water content of rivers are recorded in detail, taking into account rainfall, runoff, water abstraction, and so on. A fully accurate register of water supply and use of water by individual parties is maintained: something like water accounting. On the other hand, Australian water rights are tradable. For the Australian culture and economy, this system seems to work well. Australians pay for their water rights, and they can also sell them. This produces a market equilibrium and provides incentives to use less water. In our countries, citizens have water rights for a given abstraction rate, even if sometimes they might need considerably less. The third pillar is also important for dealing with droughts.

PAVOL NEJEDLÍK

We know water has a certain economic value. In Slovakia, the price of water has increased forty times over in the last thirty years. The cost of 1 m² was less than 8 cents in the early 1990s. Now it is more than 3 euros. In consequence, water consumption has decreased from 150 m² per person per year to about 77 m². Nevertheless, even if we have enough drinking water, we must keep the water in the region, in Central Europe. Professor Blöschl has outlined some possibilities for how to achieve that.

FRANCI GABROVŠEK

In Slovenia and Slovakia, the right to drinking water is enshrined in the constitution. I believe this is important. There is no specific legislation to regulate that right, but to have it in the constitution will help safeguard the people’s water rights. There will soon be a social debate about the right to water. As for the long-term stability of water supply and water management, we have to strengthen our observation networks and introduce the resulting data into our models. This will help us to narrow

down our projections. In Slovenia, carbonate aquifers have historically been observed at the boundaries (i.e. at springs and sinks). Recently, we have begun to focus our observations on the active stream caves of the inner parts of aquifers. The aim is long-term observation of water levels and flow lines, and so on. I am happy to say that the environmental agency that manages the water business in the country has started to follow our lead. So I am optimistic about what is being done. Something we easily forget – because we have bigger problems elsewhere – is that the phenomenon of intermittently flooded areas is emerging in karst areas. You might have heard the term ‘polje basin.’ In the last decades, these areas have increasingly become subject to intermittent floods. For 50 to 60 years there wasn’t any problem, but floods have become more frequent recently. These intermittently flooded areas are also important ecosystems, which are changing and obviously will change even more in future.

VÁCLAV ŠÍPEK

What is the situation in Poland? You mentioned that you have 1,500 cubic

metres of water per inhabitant, which is very close to what we have in the Czech Republic. There are heated discussions about that problem in our country.

PAWEŁ ROWIŃSKI

There is no single answer to your question. Solutions very much depend on which problem we want to solve and where. We need to think about technological measures in urban areas where we have to protect people from floods. It's a different story in agricultural areas. We can develop green solutions, and we should. In Poland, we are in the middle of another debate, which is strongly related to climate change even as people don't seem to be aware of the fact. This debate is about constructing new navigation canals and altering existing rivers to make them more navigable. Historically, Polish rivers have not been altered all that much. One example is the Vistula River, probably the largest river in Europe, extensive stretches of which are not regulated. The debate is about whether we should go the same way as many other countries, who regulate everything and demolish exist-

ing dams. In France, several dams were razed just recently. This is a complex problem.

I would like to give you an interesting example. An unfortunate event, which can also be seen as a kind of natural experiment, took place in Warsaw recently. A collector in a sewage treatment plant collapsed during low water levels. This could be understood as a simulation of what will happen when rivers carry less water. A significant amount of sewage went into the Vistula River. Political scuffles and blame-shifting ensued in the aftermath. I believe scientists like us, in situations like this, should jump in with projections and calculations and possible solutions. It turned out that the Vistula, not being well regulated, still has the capability to self-purify. The concentration of pollutants measured downstream was not all that significant. In the naturally meandering stretches of a river, there are many sandy islands and bends with the ability to contain and filter these pollutants. This casts some doubt on the concept of total regulation. Another problem with making rivers more navigable is connected to climate change. We have to expect long periods when the water level in rivers will simply be too low

for navigation by boat. As has been said, we need to look at the problem in a holistic way. We need to identify the major problems of a particular area, be that flood or drought. And we need to include an aspect we have forgotten in the course of our discussion: water quality. As water quantity decreases, so will water quality. The major problem of Polish rivers, in my eyes, is the quality of their water. That is even more important than the amount of water. We may have less water than in the past, but we are not Africa, and we will have enough water to live and survive. The quality of our water, however, affects us directly. Connected to all this are the dropping groundwater levels. We are facing a combination of serious problems, water quality among them.

AUDIENCE SPEAKER 1

I am not a specialist; I am a sociologist. However, I would like to ask the following question. What we are witnessing right now is a growing social awareness of the problems caused by climate change. As we know from specialists, there are basically two types of strategy on how to react to climate change. Either we try to

mitigate it, or we try to adapt to it. Do you have any data on whether increasing social awareness of the dangers of climate change affects strategies of mitigation and strategies of adaptation?

VÁCLAV ŠÍPEK

In my experience, it is difficult to obtain such data. To my surprise, water management companies tend to hide water shortages. If, for example, a village suffers from water deficiencies during the vegetation season, large tank trucks arrive to pump water into the reservoirs just so people won't experience their tap water running out. So companies guarantee that water will keep running from your tap. People are not informed about water shortages. I tried to find sociological studies and did not find any, at least in my country.

PAWEŁ ROWIŃSKI

So: we can adapt, we can mitigate, and we can do something in between. To some extent, we will need to adapt to the problems that will definitely arise. We also need to mitigate them,

mainly by reducing CO₂ emissions. Public awareness has been improving. There is now more pressure on politicians, for example regarding construction. We are seeing green solutions crop up in cities now that would not have stood a chance ten years ago.

JÁNOS JÓZSA

This is an important issue, and I think social scientists should largely contribute to it. We should cooperate in our research. We should learn from each other, and we can learn from each other because our disciplines are different. You sociologists have a different culture. We, as more technical scientists, are driven by concrete goals, whereas your awareness of society is much greater. It is a multidisciplinary problem; cooperation would be helpful, and we have a desperate need for data. Data can always tell us something, either through simple analysis or via deep learning, including from a mathematical perspective. There is a great need for data. I wonder why governments have not got such actions underway.

AUDIENCE SPEAKER 2

I am an environmental historian at the Austrian Academy of Sciences. I am genuinely concerned about long-term questions, and hydrological cycles are long-term issues. In what way would a completely vegetarian diet affect the water problem in your country? This is a land use problem, and beef production, for example, is a highly water-intensive type of land use. This has been discussed, but not, so far as I am aware, at the interface with the hydrological community. Interactions between the social sciences and the hydrology community tend to be about flood protection above all else. Günter Blöschl is a pioneer of socio-hydrology, which in my eyes is the way forward for all of us. My second question: how alarming is the corruption issue? Corruption is one of the major environmental problems. Bringing in water and pretending that there is no problem is rather a corrupt way of dealing with things. Austria is not doing all that well on the corruption index, but on the level of the state we are not very corrupt. Corrupt regimes do exist. You were alluding to Venice. That the Venetian flood protection system has not been built is basically a corruption issue.

Perhaps if you would step back and look beyond your own country, you might find interesting hydrological issues associated with corruption.

PAWEŁ ROWIŃSKI

There are two particularly important issues. The issue of food is not only a matter of a vegetarian diet, but also one of food waste. One loaf of bread thrown away is more or less 400 litres of water wasted. Regarding the food industry in general, and our attitude towards food, it's not only the consumption of meat that is important. I am sure this is an area for future studies. It is also of crucial importance for sociologists. Meat is definitely a different story. I do not know if there are already studies on how vegetarianism affects water consumption. I have not seen such studies. Still, in principle I would like to cover the entire area of food as a problem. As for corruption, I have not heard about any relevant studies. However, it's easy to imagine how strongly corruption might influence decisions regarding the environment. Such investments are costly. They lend themselves to corruption. I do not have an answer, but it is an interesting question.

GÜNTER BLÖSCHL

I also think this is mainly for social scientists. Hydrologists and water managers can deliver calculations on the efficiency of such changes but, in the end, it's the people's choice. The question is whether society is willing to restrict consumption of meat or anything else. It is up to the people.

PAVOL NEJEDLÍK

This also has to do with the proportion of irrigation in agriculture. China is a prime example. Projections show that if the entire Chinese population were to change to a vegetarian diet, water consumption could be reduced by 50%. That's a big difference. In countries where there is little irrigation, like Austria, the local difference will be insignificant. On the other hand, not all meat consumed in Austria is produced in Austria. Imports may come from areas where livestock feeds on irrigated crops.

AUDIENCE SPEAKER 3

You mentioned that water levels in rivers have been falling in recent

years. The Danube has also been very low. As a fly fisher, I have seen that personally. Never before in my life have I seen such low water levels. From what I know, electricity production almost broke down, so it was a real problem. We had to import significant amounts of electricity. Maybe Professor Blöschl can give some data. How will we handle that by building reservoirs? I have not seen a solution for this here.

GÜNTER BLÖSCHL

Two thirds – 66% – of the electricity production in Austria is hydroelectric power. The difference between water use for electricity and water use for agriculture is that hydro power is not consumptive, which means the water is not evaporated: it can be reused downstream, and it can be reused in Hungary and in other countries. That's why we are usually not very concerned about non-consumptive use, because the water is still there, just at a lower elevation level. Projections for energy production from hydro power in Austria are stable. There may be more variability within the year. There are concerns that the seasonality may change to earlier in

the year, but the annual production will not change much according to the forecasts. This is because there is a trend of increasing rainfall in winter and decreasing rainfall in summer. Over the year, the differences are relatively small. And then there is what we call the water-energy-food nexus. Water is connected to food; we talked about that. The water-energy nexus, as you said in your comment, is a particularly important area. In the energy sector, it is not only water but also the other renewable resources that are dynamic. We have seen how the development of windmills has changed over the years. In Austria, we have around 10% of our electricity production from windmills while, fifteen to twenty years ago, it was zero. We can expect a dynamic development. Another dynamic development concerns a better-connected electricity market in Europe, with stronger power lines, which makes the exchange of energy across Europe more efficient.

PAVOL NEJEDLÍK

I would like to add something about corruption. Six or seven years ago, it was not against the law in my

country to produce hydro and wind power. Nevertheless, the government decided that this energy may not be fed into the power grid. You could use it to power your kitchen, say. The lobbying came from the nuclear community. At that time, a new nuclear power plant was being constructed, and many billions of euros were funnelled into it. So they did not want the competition from windmill power. Today, we produce over 50% of our electricity from nuclear sources, 40% from coal and 10% or less from alternative sources of energy. These are the consequences of government actions.

CONCLUSION VÁCLAV ŠÍPEK

We found that the impact of climate change in terms of temperatures and precipitation is non-uniform across Europe, and even across our region. For example, precipitation will likely rise in Austria while the average precipitation in the Czech Republic or Slovakia will remain stable. Besides the precipitation changes, we will observe rising temperatures throughout the region. These will have a significant impact on the

amount of snowfall in winter, which will affect the replenishment of groundwater during this period. This means a drop in groundwater levels during the vegetation season. Also, groundwater is significant for many sectors of the economy.

So the changes will not be uniform, but they will be observable throughout the entire region, and we will need to adapt to those changes.

Besides the changes in available water resources, there will also be changes in water demand. The rising temperatures will increase evaporation, which means that the agricultural sector will need more water for irrigation to keep production at current levels.

To address the changes in water availability and water requirements, a variety of measures is necessary. One approach is to exploit new freshwater resources. The potential to find new sources of water in our region is limited, as most of our countries do not have coastlines. Even in coastal areas, desalination measures are unlikely to play a major role in future. A more promising approach lies in government actions to introduce water-saving measures. These include, for example, changes in land use: allocating areas for forestation,

agriculture, and construction. They also include shifting agricultural production from water-intensive crops to crops with low water consumption. An interesting idea was to establish dedicated agencies for water-related issues, to enable a swift and efficient decision-making process. When decisions are made by several ministries or institutions, processes tend to become slow and cumbersome. The introduction of water taxes to provide incentives for saving water was another sensible idea.

These changes in the seasonal distribution of available water also need to be considered when developing suitable measures. The efficient connection of water supply lines will enable the transportation of water from abundant regions to arid ones.

Short-term actions to increase societal awareness of water-related issues were suggested. Often, local municipalities are not educated about the problem, which makes them less willing to introduce suitable measures.

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GÜNTER BLÖSCHL, *Professor and Head of the Institute of Hydraulic Engineering and Water Resources Management at the Technical University of Vienna. His main research interests are in understanding floods and droughts in a changing climate and the underlying processes of runoff generation in the landscape, and in providing high-level advice to government agencies regarding water resources management decisions.*

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PAWEŁ ROWIŃSKI, *Vice President of the Polish Academy of Sciences and Professor of Earth Sciences at the Institute of Geophysics of the Polish Academy; his research interests include various aspects of river hydrodynamics. In 2018, he was elected Vice-Chair of the Europe Division Leadership Team of the International Association for Hydro-Environment Engineering and Research IAHR (second term of office).*

PANEL 3

THE IMPACT OF THE EUROPEAN RESEARCH COUNCIL IN LOW-PERFORMING EU MEMBER STATES

Chair:

László Lovász, HAS

Panellists:

Jerzy Duszyński, PAN

Ladislav Kavan, CAS

Roman Jerala, SASA

Gergely Böhm, HAS

Francesca Ferlaino, OeAW

LÁSZLÓ LOVÁSZ

The ERC – the European Research Council – is important for all of European science. It demonstrates that science can be managed on a much more honest and meaningful basis than most of our everyday life. This morning, there was a meeting of the V4 academy presidents plus two more, because the Slovenian and Austrian Academy presidents also joined us. Perhaps *the* main topic was: How can we improve participation in the ERC? Nobody doubted the importance of the ERC. Yet it emerged that, if we cannot improve our participation in ERC programs, this might have political consequences.

Gergely Bóhm, head of the International Relations Department of the Hungarian Academy, volunteered to give a brief introduction with some relevant data.

GERGELY BÓHM

The performance deficit of the EU13 countries is highlighted by their ERC results. Data shows that the EU13 countries hold a mere 5% of the Horizon 2020 funds but, for ERC, that percentage drops to just 2%. The ERC

results amplify the difference between member states with advanced science systems and low-performing member states. There is a strong correlation between GDP and ERC performance. Although this explains part of the problem, it also gives us an indication of the potential for success of targeted national programs. Is it at all possible to turn these results around with small-scale national programs? When the difference in macro figures is large that might be difficult. The correlation between ERC performance and publication data is even stronger, almost 97%. Since the ERC evaluation system is also at least partly based on the most-cited publications and those in top-ranked journals, national policies aiming to improve ERC results must also address shortcomings in publication data as the main indicator of scientific performance. Despite the decisive nature of these general factors, we can still see that some countries in the EU13 group, Hungary and Slovenia among them, perform better in ERC than their macro indicators would suggest. Others, with decent performance in terms of scientific publications and other Horizon 2020 programs, are still lagging behind with their ERC results: in particular, the Czech Republic and Poland.

When researching the reasons for poor results, two things stand out. The number of applications is lower than average among EU13 member states. But the difference in the success rate is much more pronounced. Hungary is the exception: its success rate is on a par with EU15 countries, but the number of applications is still low. The reasons are both macro-level – such as GDP per capita, or R&D spending – and micro-level, such as the lack of state-of-the-art research infrastructure and of a critical mass of excellent researchers. Usually there are no strong centres of excellence. Government assistance and local support for the acquisition and administration of externally funded projects are also often inadequate. Considering the ERC's evaluation methods, questions may also arise regarding unconscious bias against proposals from low-performing member states. The number of panel members from these countries is lower and language barriers make the evaluation of proposals more difficult.

JERZY DUSZYŃSKI

In terms of our science budget, Poland is lagging behind countries

that allocate 3% or 2% of GDP. We dedicate less than 1% to science – much less. We started from a low level and are improving our scientific performance, but others are improving theirs faster. The gap is widening. What can we do? The ERC system is effective; I don't advocate changing it. However, it is a significant problem that the performance levels of thirteen countries are much lower than that of the remaining fifteen. Our human potential is considerable. Our financial potential, less so. The political perspective is that we are funding the research of more scientifically advanced countries. Calculations were published in Poland showing that we recover just 30% of the funds we contribute to the EU science program. Politicians question why Poland should finance research in the UK or the Netherlands. Scientists argue that ERC-funded research sets the standard and provides a direction. This does not satisfy our politicians, who are thinking of their electorate of taxpayers. So what do we do? We have to improve our success rate. We have to focus our science systems on doing excellent science. Some of the problems are political; others come from within the scientific community. I have suggested to the ERC Council,

who are aware of the problem, that they should invite more observers to the panels: people who are not involved in the decision making, but who can provide feedback on problems. Another possibility would be to introduce quotas. Quotas are not very popular; one problem we are facing in our attempts to increase the number of women in the Polish Academy of Sciences. Quotas are not a perfect solution, but they are a solution. We might introduce a quota on the panels of, let's say, 15%, made up of top people from other countries who can bring in different perspectives. Science today is the search for talent, and these talents are identified by the ERC.

One problem Poland shares with Slovakia has already been mentioned. We have an international baccalaureateship. Many of our top school students are recruited to universities in the UK or other countries. Often, they stay there for their PhD. And, if they are successful, they often don't come back at all. So we are losing our talents at an early stage. I am aware that we shouldn't hold these young scientists back without also giving them the possibility to develop their potential. It wouldn't be fair to condemn them to a career of mediocrity

because their research environment is not able to nurture their talent. But the problem exists.

LADISLAV KAVAN

As Professor Duszyński has said, our discussion will not be a very encouraging one. We are here to identify problems and, ideally, to find solutions. There won't be a quick fix. It is a mosaic of problems and multiple partial solutions, which will hopefully help us to close the gap between our "underperforming" countries, as they are called, and the rest of Europe. Keep in mind: we need to convince our politicians that devoting funds to science and specifically to European framework programs – Horizon 2020, of which the ERC is part – isn't a lost expenditure, but rather an investment in the future. Scientists will transform that money into knowledge. And, as the famous British philosopher Francis Bacon said, knowledge is power. We are not just asking for money to keep our scientific projects running. With sufficient funding, we have the capacity to improve Europe's future. We have to keep reminding our politicians of that.

In the EU13 countries – the new member states – there is room for improvement in the situation with the ERC. The ratio of how much states invest in the framework programmes to how much their scientists raise from those programmes is not very favourable in the EU13 countries. But there are exceptions. You might recall a publication that appeared in *Nature* in May 2019, just before the European Parliament elections. The citation is *Nature* 569, page 472. One of the chapters has the title “Unfair system?” which is a very explicit title, and there is a bar chart of winners and losers. The zero line is the break-even point, where every euro invested by a member state into the framework program is won back by the scientists in that country. Not everybody can be a winner. Poland’s scientists, for example, only get back 30 cents per euro invested. However, the absolute winners – the top three countries with the longest bars on the chart – are EU13 member states. Country number one is Cyprus, number two is Estonia, and number three is Slovenia. These three countries are able to secure much more money from framework programs than they are investing. Among the ‘losers’ are Germany, Italy, France, and all the V4

countries. So, even there, scientists cannot recover every euro invested. Regarding Advanced Grants, which go to the leaders in their respective disciplines, the ERC is a club for top-level scientists. Early-career scientists apply for Starting Grants, which are limited by “academic age”: i.e., 2 to 7 years post-PhD. Next are Consolidator Grants, for scientists between 7 and 12 years post-PhD. These two types of grants are awarded to comparatively young scientists. So the main focus of our discussion should be how to improve the very unhappy situation where we are not able to attract scientists to propose and lead such ERC projects. One aspect is evaluation on a national scale. We should not compare, say, a scientist in Prague with a scientist in Brno or Olomouc. We have to evaluate our Prague scientist alongside top people at the European level. Another important aspect is the quality of our PhD students. At master’s level, we have talented students. We know this because, when these students go abroad, they are very quickly able to produce high-quality science. There is, however, a problem with our PhD studies, particularly at the Academy. We don’t have the right to award PhD degrees. This is a privilege of

the universities. Yet another aspect is a damaging academic practice facilitated by some countries. A young scientist studies at university, continues to PhD there and subsequently builds his or her academic career at the same place. This is absolutely not acceptable. The ERC is international, and top science is international. So we must send our young people abroad to do top science on an international level. If we fail at that, we will fail with the ERC.

ROMAN JERALA

I think we all agree that the ERC is a success story, not only at the European level but also globally. The ERC is internationally respected for funding basic science. For the under-represented countries, the ERC can be a significant motivational force, setting a shining example for the positive transformation of science systems. I would like to start with a few astonishing numbers. I have compiled a list, which admittedly is not complete. Comparing the number of ERC grants per million population, which is only appropriate, Austria ranks high with 27 ERC grants per million population. It is in the top 25%,

but still considerably lower than the highest ranking countries, like Switzerland with 72 or Israel with 55 grants per million. But the difference between the EU13 and Western European countries is substantial. Hungary is the most successful of the EU13 countries, yet all other Western European countries rank higher. Hungary gets roughly one-fourth of the number of ERC grants per capita compared to Austria. Other EU13 countries get even less. Hungary has about 6.5 grants per million population. Next in line are Slovenia and the Czech Republic with 3.9 and 3.4, Poland with 0.73, and then Slovakia with 0.19. That's worrying. Something needs to be done to improve the success rate in these countries.

In the introduction to our discussion today, a clear correlation was mentioned between investment in science and ERC success rate. We have to do our homework, so our countries need to invest more in science, and excellent science in particular. The ERC is virtually the only instrument at the European level that funds basic science. Only the ERC and Marie Curie remain as instruments for funding fundamental research. We need to increase the budget for science in terms of a percentage of the GDP. We

need to convince our countries to invest more. We also need to improve the national evaluation procedures in the direction of performance-based funding. Many of our countries are still maintaining a status quo, with low motivation to reward excellent scientific performance. Then there is infrastructure. We in Slovenia point to the examples of Poland and the Czech Republic, where there has been considerable investment in research infrastructure. Research infrastructure is the fundament on which excellent science is built. In the introduction to the Joint Academy Day, the president of the Austrian Academy evoked this vision of the European research area, where a scientist from Ljubljana could easily go to Munich and vice versa. The reality is that the asymmetric brain drain in all EU13 countries is enormous. Research infrastructure is one reason for this; another is researcher income. Scientists' salaries are significantly lower in EU13 countries, which is a major incentive for leaving or, rather, prevents visiting scholars coming from other countries. This also affects the situation of those researchers with one of the few ERC grants, who are hard-pressed to recruit the excellent science personnel they need

to complete these ERC projects successfully.

While these problems need to be addressed on a national level, there are some things the ERC and the European Commission could do to improve the situation. Unconscious bias on the part of panel members has been mentioned. The chairs of evaluation committees instruct their panel members to guard against gender bias, but not against host-institution bias. It is probably intuitive to all of us that the probability of, say, a Cambridge University proposal being funded is considerably higher than that of a proposal from the University of Ljubljana. In the run-up to this panel discussion, I suggested some possible measures to Éva Kondorosí. It turns out that ERC candidates from EU13 countries fare much better in the second round. The first round is decisive. It is based on the PI's [Principal Investigator's] performance score, which is mainly correlated with high-profile publications, and the bar is set very high. The problem is that peer review for high-impact publications poses the same bias challenges for EU13 researchers. One possibility would be to shift the focus of the first evaluation stage away from the PI's per-

formance. At the second stage, with external reviewers, the candidate's track record could be taken into account with an eye to the feasibility of the project.

Scientists from EU13 states seem to be well represented in ERC evaluation committees. I don't believe there's a conspiracy. Those panels are doing a good job. But there is nevertheless some unconscious bias. The EU introduced a number of measures to address the problem of low-performance countries: for example, the widening instruments. In those instruments, however, it's not excellent science that's being rewarded.

In any case, the ERC must remain based on excellent science, excellent ideas. This is the core of the ERC idea. In conclusion, there's a lot of work to be done on a national level, but we can also help the ERC to improve the situation.

FRANCESCA FERLAINO

My expertise on this panel is somewhat different to that of other members. I am here as someone who has received two ERC grants, one Starting and one Consolidator Grant. I have also served as a member on ERC

evaluation panels. Thus, I was able to see how the system works both from the applicant point of view and from the inside in the decision-making process, in the field of quantum physics. That's part of the Fundamental Constituents of Matter panel (PE2). Firstly, I would like to say that, when it comes to statistics, the first natural reaction is: I would like to change this number; the low number of ERC grantees in EU13 countries is a problem. And it is a real problem. In my opinion, these low numbers also reflect internal problems. I don't think we can quickly fix the low number of ERC grants awarded in these countries before we address all the problems that caused it. There should be discussions on a national level about ways to transform the science system over a timescale of ten years. The ERC evaluation criteria really are extremely selective. As panel members, we are asked solely to assess quality without any regional considerations. Quality concerns the PI's performance (CV) and the scientific project: let's say, the "idea" behind the proposal. In the panel's guidelines, the ratio is almost 50/50. Sometimes a project might weigh a little more than a CV; but still, the CV is crucial. This is also true for ERC Starting Grants.

Here applicants need to prove early academic achievements and a potential for independent research. At this early stage, the national support for research and the local infrastructure play a key role. As has been mentioned, the problem therefore already arises at the early-career stage, creating a potential performance gap and thus a gap in opportunities. Scientific performance and CV are largely impacted by where you studied, how many publications you got during the PhD and postdoc years. These aspects are already highly visible at the starting level. Governments need to see the low number of ERC grants as an alarming signal and revise their policies to change the situation, especially for young researchers.

One example: I had the privilege of collaborating with a group from Ljubljana. They had the funding, but not the experience to perform an experiment they had devised. I invited them to my lab for a month, and now they are very successful back in Ljubljana. They are writing their first publication in a highly competitive field. I had a similar experience with a Polish researcher I hosted in my group, who then obtained a grant within the EU Horizon 2020 programme for spreading excellence

and widening participation. Another example: Innsbruck researchers, myself included, are part of the Scientific Advisory Board of the Centre for Advanced Laser Techniques in Croatia, and we supported its establishment as far as possible. These are very timely examples of the importance of scientific networking.

Another possibility for EU13 countries to increase their science performance would be to establish centres of excellence. While some may see this as unfair, these centres of excellence create a momentum that also boosts the performance of other institutions. They also serve as a showcase to the international community. Starting with these centres of excellence, it should be possible to improve some of these numbers. I repeat that ERC numbers are mostly a reflection of internal problems.

LÁSZLÓ LOVÁSZ

I would like to start with an idea that might seem trivial to you. Every day, throughout the European Union, smart children are born. How can we help these talented kids become ERC-level scientists? That's a long process, and it's fraught with prob-

lems almost every step of the way. We could improve science education, general education, university education. We are actually doing fairly well in those areas, as can be seen from the large number of scientists born and raised in our countries who have gone on to secure ERC grants in other countries. Still, there is room for improvement.

Then it is crucial to give the younger generation access to world class scientists as mentors and role models, to help them use cutting-edge research methods and set scientific goals. Part of this problem is the brain drain that saps the top scientists born and raised in our countries. I think you're right, Francesca, that we have to address the problems at home, on a national level. But this is a complex process. If we cannot credibly prove to our governments that what we are doing is valuable, they will not listen to us. We have to convince them to spend more money on science, and to help us create an environment that is more conducive to doing science. And, to back up our argument, we need ERC grants and other successes in international science. So we are caught in a vicious circle, and we need help.

FRANCESCA FERLAINO

Before coming here, I read an interesting 145-page European Commission report about the EU13 situation, with some hypotheses and information on short-term measures. Apparently, the new set of European Commission programs for spreading excellence and widening participation was not as effective as expected. When I looked at the statistics of which countries benefited most, I was extremely surprised to see that Germany, and not the EU13 countries, ranked highest. I read this part several times because I had trouble understanding how such a thing could be possible. This may be something to think about. Either these programs get little publicity, or they are not accepted in the EU13 countries. Why are the EU13 countries, to whom these actions are directed, not applying?

GERGELY BÖHM

It is not true that they are not applying. The widening participation measures are only 1% in total of the entire Horizon 2020 budget. So, even if they were all spent wisely, they wouldn't really change the big picture. Then,

all of these programs are based on cooperation. To apply, the scientists in low-performing countries need to present partners from established EU countries. Most of these collaborations are well-prepared and effective, but the salaries and other costs of these partners are usually significantly higher than those in low-performing countries. This is why, in the end, more than 50% even of the widening budget goes to well-established EU countries. It is a surprising fact, but that's how it is.

During the negotiations for Horizon 2020, these schemes were offered by the Commission to the new member states as a nod to the problem. No one thought at the time that, with 1% of the total Horizon 2020 budget, this would make a huge impact. And, in the end, it didn't.

ROMAN JERALA

On another note, it is a commonplace that applicants from EU13 countries don't know how to write proposals. In Slovenia, we sometimes even hire companies from Western European countries to help polish our proposals, which perhaps helps a little, but – not really.

I would like to mention, however, a very effective instrument Slovenia has introduced: the complementary scheme. ERC applicants who receive a high score in the evaluation but are not awarded a grant receive funds to perform the research they applied for, as a national project for a duration of two or three years, depending on the type of ERC grant, whether the proposal got to the second stage, and what score it received. This has turned out to be a very effective incentive for preparing high-quality applications and for developing project ideas for the next application. This program is also one of the reasons why Slovenia has very high number of ERC applications per million population. The number is very close to Austria, but the success rate is only 2%. To receive one of these national grants, which show that the project went through the demanding ERC evaluation process and received a high score, is like a seal of excellence. This program ensures that much of the science budget goes into excellent science.

LÁSZLÓ LOVÁSZ

I would like to mention another vehicle. Other countries are experiment-

ing with something like this, but I think Hungary was the first to introduce it. This grant system is commensurable with the ERC grant. The grants are for young people, preferably on their return from abroad, but this is not an absolute criterion. The support they get is comparable with an ERC grant, which means they can set up their own research facility, research lab, or group. This seems to be quite successful in preparing people for an ERC grant. Proposals are written in English, in the style of an ERC grant application, and evaluated by anonymous referees. Altogether, this instrument has contributed significantly to our relative success. It was introduced ten years ago, so it is showing results.

Let's open this up to the audience.

AUDIENCE SPEAKER 1

I come from the Netherlands. We are among the bad guys in this debate, and I'm aware of that. Our government is very much aware of the Dutch success in the ERC program and actually uses it as an argument to keep down the Dutch budget for research funding. So it's possible to get too much money from the ERC.

Of course, compared to the situation you are in, there is fundamental injustice in the European science funding system at the moment. One reason why I'm here is that the Dutch Academy wants to collaborate in a process to change this. I think it is in our shared interest, as European academics, to create a healthy and sustainable funding system that in the long run works for all of us and not only for what we call the "inners".

Another anecdote: I'm a humanist, a historian, and I talked to a colleague who sits on two ERC panels. He told me – and this is just a piece of information I would like to share with you – that EU13 scientists are their own worst enemies. The people from EU13 member states who write ERC proposals are often the panel members judging proposals from those same countries. And the other panel members often don't have very much to contribute to the evaluation.

Personally, I am a believer in quota systems. The Dutch Academy created a program where only women could apply. The number of female members in the Academy increased, and this has changed the environment. A similar instrument might work in the ERC.

I was also thinking about joint applications. One way to change the environment could be to allocate part of the budget to projects with a substantial contribution from EU member states. It would channel money towards EU13 members, but it would also create programs where good practice and new methods could be shared. We have heard about examples of this but, then again, we also heard that most of the money went to Germany, which obviously was not the purpose of these collaborations. I would be interested to hear what you think about such programs.

GERGELY BÖHM

In Horizon 2020, the widening participation scheme was a separate program. It was not a horizontal objective throughout the whole program. If it is continued as a horizontal objective in Horizon Europe, it could make more of a difference. Another argument concerns impact. The European Commission aims for social and economic impact throughout Europe but, if there is no participation from EU13 countries, then what impact could it possibly have in those countries?

LADISLAV KAVAN

There's actually a more general problem. And that's the endless discussion about excellence versus inclusion. We can also translate this into the question of whether we really need the so-called "double-speed Europe" or not. My opinion is that double-speed Europe is nonsense. There is only one science. And that one science should be excellent science.

Second comment: we have been discussing how to motivate young people so that, after decades of cultivation, so to speak, they become leaders and get ERC Senior Grants. In the Czech Republic, we have several instruments to motivate young people to write ERC proposals. Our success rate is very low, only around 6%. The total success rate in Europe is also not that high, around 15%. Switzerland is the most successful, with a 22% success rate. That's an exception. Israel is number two. Young people need starting money for their research, and they tend to avoid expending effort on something they will almost certainly fail at, because 6% is nothing. So they prefer to apply on the national level where the success rate is better. We have a program where we support ERC applicants who received

a score of A or B in the second round but were not awarded an ERC grant. They receive the same amount from the national budget. It is similar to the “Seal of Excellence”, which works at the level of framework programs. In the Czech Academy of Sciences, about two-thirds of the Horizon 2020 proposals receive good scores, but only 17% are actually awarded a Horizon 2020 grant. The Seal of Excellence relies on the fact that those proposals have been evaluated by international authorities. There are other instruments as well. The Czech Academy of Sciences has an award for young people, with the condition that they have to write an ERC proposal. The Czech National Science Foundation has a program for young people with the condition that successful applicants have to write an ERC proposal during the project period. Of course, it’s debated whether these programs are efficient enough. If we just push people to write something, they often end up at the C level in the first round. Which means they cannot apply for the next two years. Then, if someone who will never succeed in the ERC keeps reapplying again and again, that’s a waste of time. Effective measures are hard to come by, and we are here to discuss these problems.

JERZY DUSZYŃSKI

World science is moving forward, and Europe is lagging behind China and India and other countries. One of the purposes of the ERC is to keep Europe in the game. We should not forget this.

We have tried many systems to improve the situation. For example, twinning programs for international agencies for science. The Max Planck scoring program. All these programs are tied to strong partners from abroad.

National funding is very important. But the pool of excellent scientists is not very large. The problem is, these people are saturated with national money to such a degree that they tend not to bother. We can tell them it is immoral of them to apply for national grants. But this is a problem. There is no solution. We have to change the system. The ERC is the lamppost, the orientation point, the direction sign. We have to assess whether our science reforms are working or not. It takes years to verify the results of our interventions, and the situation is changing so quickly. For example, I doubt the effectiveness of the recent reforms in Hungary, but we won’t see the results until perhaps ten years

from now. By then, today’s decision makers probably won’t be involved in policy strategy anymore.

I believe in quotas on panels. I believe in observers on panels.

Five years ago, I knew very little about the system. We made some fundamental mistakes. We sent people off to excellent postdoc positions and, when they returned, they landed in the very same groups they had left. And then there was the call for their papers, and that’s a killer. We didn’t know that. We lost very good people because of our mistakes. We know better today.

AUDIENCE SPEAKER 1

We have heard that the evaluation of ERC proposals is based on the PI’s track record and on the quality of the project, with a ratio of roughly 50/50. Do we have statistics? What is the rejection ratio for EU13 countries in terms of project quality versus PI track record?

JERZY DUSZYŃSKI

ERC referees receive hundreds of applications; they are very busy and

have little time to spare. So it is my impression that, although they are told not to do so, they are mostly looking at publications and checking whether someone has published in top journals. If you do not have such top-level publications, it will be very difficult to move to the next stage. We can count the top publications from our countries. 25% – fantastic. 1% – we have a problem.

AUDIENCE SPEAKER 1

I have doubts about this evaluation practice, because it is discriminatory. Let's say we have a small research budget. So the overall number of publications generated by the scientific community in one of our low-performing countries is smaller. So the publication record of our ERC applicants will usually be lower. So we cannot get more ERC projects. This is a feedback loop. Would it make sense to change the principles of the system and reduce the influence of the track record?

JERZY DUSZYŃSKI

From a national perspective, it's the choice between distributing money

to 100 institutions and concentrating money in five top institutions. These are the decisions that can change the situation. In Poland, we are spreading the money to such an extent that there is no dominant institution. There is Warsaw University, but it doesn't receive ten times more than a mediocre university somewhere. No, it has one and half points. That's it.

FRANCESCA FERLAINO

I would like to clarify: there aren't two separate rankings, one for the curriculum vitae and one for the PI's performance. There is one ranking, and both aspects feed into it. To split them would be counterproductive. Also, the evaluation process is very complex. The panel members don't actually tend to view the publication number as a meaningful figure of merit. The assessment of the CV is usually very in-depth, taking into consideration the influence of the research environment on performance level, and estimating performance potential in a more conducive research environment. And then, if you are able to improve the research environment with your ERC grant, what would your potential for develop-

ment be? We need to keep this flexibility without making everything dependent on numbers. Otherwise every measure will be unfair to some applicants. Please trust that panel members are doing in-depth work.

AUDIENCE SPEAKER 2

A colleague of mine applied and the referee report stated that the project is nice, but the quality of the structure is poor, and it was rejected. His track record was poor, but the quality of the project was not. The quality of the project was good, but it was rejected.

FRANCESCA FERLAINO

Every panel has a 12% success rate.

LÁSZLÓ LOVÁSZ

Your question brings up the issue of track record. It's not possible to evaluate at this level of relative track record. An applicant needs results that are already earth-shattering in order to be considered. And that's difficult to achieve if your home in-

stitution doesn't have the equipment or doesn't have the scientific leadership needed for that. I don't like the idea of filtering other aspects into the decision. The ERC grant should be based on merit, full stop. But perhaps someone could come up with a scheme that would compensate for lack of previous leadership. The ERC actually has ideas about this. I don't know whether they have been established, but the idea is to have a grant that would allow people from EU13 countries to get funding for a year.

GERGELY BŐHM

There is an ERC visiting fellowship where the fellow can spend 1 to 6 months in an ERC group, which is successful, although it's not supported in all EU13 member states. This is supposed to be financed by the National Research Councils of the member states.

LÁSZLÓ LOVÁSZ

That could be helpful for EU13 countries. But let's separate these two issues. How can we compensate for a comparatively poor track record

because of factors that have nothing to do with the talent of the applicant?

JERZY DUSZYŃSKI

We have been discussing the ERC, but the stage before that is the Marie Skłodowska-Curie Actions. Usually, countries doing poorly in the ERC are doing poorly in Marie Skłodowska-Curie. In Poland, we are doing poorly in the ERC, but in the MSCA, we are even worse.

GERGELY BŐHM

Actually, in the Marie Curie, there would be a widening participation program ...

LADISLAV KAVAN

Also, we have to remember that we are here as representatives of our academies, and there's another problem at the academy level. Have a look at the number of ERC grants awarded in each country and the number of ERC grants awarded to academy scientists. In the Czech Republic, we have eight Advanced Grants. Out of

those, six are awarded to researchers at the Czech Academy of Sciences. At the level of Starting Grants, the situation is worse. Out of eighteen of those, we have only five. The situation in Hungary is very similar. Eleven out of twenty-one Advanced Grants are situated at the Academy, roughly 50%. On the level of Starting Grants, only 30%. It's exactly the same in Poland. Why? The interpretation is very simple. We do not have good students at the Academy because they are located at the university. That's one problem specific to the science academies.

JERZY DUSZYŃSKI

The researchers working at the Polish Academy of Sciences constitute 7% of all researchers working in Poland, and they attract 50% of all ERC funding awarded in the entire country. That's fantastic. It is likely a similar ratio in Hungary: 10%, I'd say.

GERGELY BŐHM

Regarding the proposal: so, it's not possible to separate the track record from the project proposal. One dif-

ference is very clear, however. In the EU13 member states, applicants usually perform poorly in the first round, where panels only evaluate the extended synopsis – that’s the brief five-page project description – and the CV. As soon as the panel evaluates the full scientific proposal, they usually perform much better. In our scientific cultures, we need to improve our skills for preparing this concise synopsis.

FRANCESCA FERLAINO

I would be interested in your comments on some other numbers I found in the 145-page report I mentioned, which surprised me. In all European Council proposals based on excellence and innovation, such as the ERC, EU13 countries have low success rates: 4%, 5%. In other proposals, the success rate can go up to 30%, which is at the level of the EU15 countries. Also, the number of EU13 applications is substantially lower than the EU15 average. This should not be too difficult to fix. If that number goes up, overall ERC funding should go up as well. Another aspect is the rejection criteria, which I learned are twofold. Rejections are

based on scientific quality, or administrative quality. A substantial fraction of EU13 proposals were rejected because of administrative quality and eligibility criteria, not because of the PI’s performance. I was surprised to learn about this eligibility problem.

ROMAN JERALA

Probably that percentage is not significant enough to really make an impact. There might be some sloppiness with regard to technicalities, but not enough to account for the huge gap between well-performing and less-performing countries. I would like to return to track record. As you mentioned, it makes up about half of the score, though each panel has different metrics. In life sciences, for example, you almost need publications in *Nature* and *Science*. In the social sciences and humanities, the metrics is different. There are many ways in which panels evaluate a proposal. But even if your idea is outstanding, you’re out if you don’t get a good score on your track record. Even if your proposal is exceptional, you present a brilliant idea, and you can prove you are able to carry it out, you won’t get funding if you don’t have

a good track record. But if all you are lacking are high-profile papers, you have delivered solid science thus far, and you propose an excellent idea, the proposal should deserve to go to the second stage, where it should be evaluated by specialists. If we can achieve this situation, participants from lower-performing countries might have a better chance of succeeding. And that’s why I propose that the first stage should evaluate mainly the quality and originality of the proposal, and the applicant’s track record only in terms of his or her capability to perform the proposed research. Then, at the second stage, PI excellence can be evaluated as well.

AUDIENCE SPEAKER 2

You have established that one of the main problems is brain drain. Excellent people move to places where other excellent people are, and they will probably stay there. Young people need two things: self-motivation and guidance. Self-motivation is abundant everywhere, probably also in the EU13 countries. So it all boils down to guidance from experienced people. If all the experienced peo-

ple have moved somewhere else, then none of them are left to provide this guidance. This brings me to my suggestion. When people move and receive ERC grants or any other high-profile grants elsewhere, they should be given the opportunity to build a second group in their home country, including things like travel funds. In that way, excellent scientists would be able to provide guidance to young researchers in their home countries.

JERZY DUSZYŃSKI

The answer is that people should move to high-level research environments for guidance. The Marie Skłodowska-Curie program facilitates this.

I would like to address a point Francesca Ferlaino raised. In high-level institutions, there is often high-quality administrative support for preparing applications. In institutions that are not that experienced, applicants are often left to their own devices when it comes to grant proposals. And then they make stupid mistakes. You call them administrative failures. So we have to improve research support in our institutions;

this is our job. In the Polish Academy of Sciences, we have such an office, and we do see improvement. With a staff of seven, that office is unable to provide high-quality support on a national scale, although it operates on a national scale. Any good university has such an office, which is usually well-staffed. The researchers at those universities arrived at this situation because many of their grant proposals were successful in the past. Also, the scientists themselves have much more experience in preparing proposals. It's a snowball effect and we are only at the beginning.

OTO LUTHAR

You started this discussion by asking about how much funding our countries get back from the money we put into the pot. But nobody mentioned funding on a national level. Let's take, for example, Slovenia. 0.4% of the national GDP flows into funding. In Switzerland, it's almost 3%. The GDP in Slovenia per capita is close to 24,000 euros. And in Switzerland, it's more than 80,000. So we have to talk about funding on a national level for basic science; not for applications or applied sciences. If you don't have

enough money, you cannot build the foundation for programs like the ERC. I'd also like to address Roman Jerala's point about research infrastructure. This, again, is related to funding. If you don't have the means to build up the research infrastructure, you will never get people who are able to apply for these programs. Then there's the question of salaries. There's a light at the end of the tunnel, at least in Slovenia, because there is a new law in the making. If someone gets European funding, their salary will be doubled. Which is something you might consider sharing with your colleagues. People mentioned that we need help from the outside. In terms of funding, we need help from the inside. We have to persuade our political elites to allocate more money to science.

CONCLUSION LÁSZLÓ LOVÁSZ

To summarise, we need help from European sources, but we also need help from our own governments. We need to improve our education system. We need to encourage collaboration between young people in Europe.

Basic approval for the ERC was unanimous. The panellists agreed that the ERC does important work for science in Europe. This includes establishing scientific benchmarks, certification of excellence and money for research. Every time money is collected and redistributed, there will be winners and losers. In the case of the ERC, however, some of the losers are losing disproportionately. These are the countries at the heart of our debate. These countries only get a return of 30% to 40% in relation to the amount they contribute to the ERC. So this is a bad ratio. Interestingly, other countries – for example Germany – lose money for different reasons. There, federal support for science is sufficient, so scientists are less willing to expend the considerable time and effort required to prepare ERC proposals. In the V4 countries, there is dire need for these funds. The very real danger for science in these countries is that governments seriously consider withdrawing support for the ERC. That would be an undesirable consequence, to say the least. Many causes have been mentioned for the poor performance of these countries in obtaining ERC grants. The most significant reason is federal allocation of funds. A close correla-

tion has been demonstrated between these numbers and the number of successful ERC applications. European countries with a higher GDP tend to spend more money on science, typically around 3%. Government spending on science in V-13 countries often falls below 1%.

The situation is especially serious for basic sciences, as the necessary long-term support has to be provided mainly by the government. The ERC supports basic sciences, which is another reason why it is so important. One problem mentioned was the poor quality of our ERC proposals – the written proposals, not the science behind them. Statistical proof was provided for this claim. In particular, young scientists without experience and lacking the necessary support tend to make mistakes when preparing their applications. Recently, governments have started to develop suitable support structures. The quality and extent of this support varies. One of our recommendations is to strengthen and improve those support structures.

We also discussed the issue of evaluation. ERC evaluation is based on two distinct aspects: track record and project quality. In our countries, while the quality of a project may be

excellent, the required PI track record is harder to come by. Due to the lack of funding, the equipment at many institutes is less than state-of-the-art. Scientists who might have provided scientific leadership have relocated to, say, the United States. One suggestion to address this problem was to place less emphasis on track record, at least in the first round of evaluations, and more on project quality. To check that the applicant has the appropriate qualifications, the track record could be given more attention in the second round.

The question of quotas came up. There was a consensus that introducing quotas for, say, the V-13 countries would be detrimental as it would distort the scientific benchmarking element of the ERC. However, quotas for panel participation might be something to consider. We did not arrive at an agreement on whether the current participation of the new V-13 countries in the evaluation panels is sufficient. While this is largely dependent on subject area, the overall majority of panel referees still come from the EU15 countries – or perhaps the EU14 countries next month, with Brexit. Those panel members could remain a majority, but representatives from the 13 new European

countries would be able to point out some facts that are different in these countries due to their history.

LÁSZLÓ LOVÁSZ, *President of the Hungarian Academy of Sciences, is a mathematician best known for his work in combinatorics, graph theory and theoretical computer science, for which he was awarded the Wolf and the Kyoto Prizes, among others. He was professor at Yale University, a collaborative member of the Microsoft Research Center and the director of the Mathematical Institute of the Eötvös Loránd University. He received both the Advanced and the Synergy Grant of the European Research Council.*

GERGELY BÖHM, *Head of the International Relations Department of the Hungarian Academy and an economist by training, started his career at the Hungarian Academy as a junior research fellow. His interest in management led him to the central administration. He is keen to share his expertise as the member of the Programme Committee and the National Contact Point of the European Research Council in Hungary.*

JERZY DUSZYŃSKI *is a biochemist and professor of biological science, President of the Polish Academy of Sciences since 2015.*

LADISLAV KAVAN *is a member of the Academy Council of the CAS, where he coordinates the engagement of the CAS in the European Research Area. His specialization is physical chemistry. He was awarded nine European grants and has published three monographs and over 300 articles with over 14000 citations (H-index=55).*

ROMAN JERALA, *Head of the Department of Synthetic Biology and Immunology at the National Institute of Chemistry in Ljubljana, Slovenia. He is also a full professor at the Faculty of Chemistry and Chemical Technology, University of Ljubljana, synthetic biology project director at the Centre of Excellence EN-FIST and an EMBO member. Roman Jerala represents the Slovenian Academy of Sciences and Arts.*

FRANCESCA FERLAINO, *Professor at the Institute for Experimental Physics of the University of Innsbruck and Managing Director of the Institute for Quantum Optics and Quantum Information (IQOQI-Innsbruck) of the ÖAW. Her research activity explores quantum phenomena in atomic gases at ultralow temperatures. In 2018, Ferlaino and her group observed for the first time a new state of quantum matter: the supersolid. Ferlaino received an ERC Starting Grant in 2009 and a Consolidator Grant in 2016.*

PANEL 4

THE ROLE AND POSITION OF ACADEMIES/ LEARNED SOCIETIES

Chair:

Peter Moczo, SAS

Panellists:

Roman Słowiński, PAN

Zdeněk Havlas, CAS

Oto Luthar, SASA

László Lovász, HAS

Danuta Shanzer, OeAW

PETER MOCZO

The situation of learned societies and academies is a bit complicated. In Slovakia, we have our Academy of Sciences and an honorary body – the Learned Society – that does not carry out any institutional research.

The Royal Society, founded in 1660, is the learned society with the longest tradition. The fundamental purpose of the Royal Society is “to recognise, promote and support excellence in science and to encourage the development and use of science for the benefit of humanity”. I think we all agree with this brief, meaningful statement. We probably also agree that this is easy to say but much harder to accomplish, especially in the reality of Eastern European countries. The cultural tradition across different countries varies widely in terms of their appreciation of science, research, and education. The main problem in Slovakia is that neither politicians nor society at large understand that science, excellent research, and good quality education are necessary and fundamental conditions for any reasonable and sustainable development; for the survival of humanity, but also of individual countries. Some well-informed politi-

cians acknowledge this, and yet they do not act accordingly.

So the Learned Society, which brings together the best scientists in Slovakia, needs to find ways to explain these fundamental truths to our people and above all to decision-makers. In the thirty years since the political revolution – we celebrate its thirtieth anniversary this year – we have not been able to achieve this. Political freedom hasn’t helped us to improve this situation. The somewhat laid-back attitude of many members of the Learned Society in terms of its mission does not help either. I would love to hear some suggestions that will help us change the situation. The situations in other countries vary to different degrees.

However, a favourable tradition of supporting science does not necessarily guarantee the continuation of that tradition. Professor Lovász will correct me if I am mistaken, but I think that Hungary and the Netherlands are examples of this. I see some Dutch colleagues in the audience who will probably be familiar with this booklet by Jose van Beek and Wim van Saarloos. It gives an impressive example of the necessity of keeping up our efforts in educating our decision-makers and society.

For many years now, Dutch researchers and the Dutch science system have been performing outstandingly, given the money per capita, the number of ERC grants, the number of citations per publication and per capita, and so on. These numbers have been impressive despite the small size of the country; they are exceeded only by Israel and Switzerland in terms of several important scientometric criteria. We might be led to believe that, given this positive tradition, there is no reason to worry. But today’s accomplishments are the fruits of past investments. Investments in research are stagnating in the Netherlands, while neighbouring countries have redoubled their efforts. Part of the budget for fundamental research, a key criterion for successful science, has been reallocated to research aimed at meeting societal challenges. This situation compels researchers to avoid risks and focus on short-term results. Many talented Dutch researchers are lured away by attractive opportunities abroad. Slowly but surely, the high plateau of the Dutch science landscape is eroding. That the country which, for decades, was one of the best-performing in the world faces such problems is a powerful message for our discussion. Some of

the illustrations in this book are very enlightening. For example, this image of a dyke which is meant to be built higher – but the material for the necessary construction is taken from the dyke’s own foundations!

I hope László Lovász will briefly outline what happened in Hungary. Of the former Eastern Bloc countries, Hungary has probably been the best performing in terms of ERC grants and other scientometric parameters. But then something happened that we do not yet understand. There is a widespread potential to overestimate the demand for applied research in industry and to overlook the fundamental importance of free academic exploration. This is happening to some degree in the Netherlands. It is also happening on a massive scale in Slovakia. Learned societies, the best brains in the country, ought to identify processes and trends that might eventually lead to changes in the conditions that are necessary for free research and high-quality education. If we neglect this, we might be in for a nasty surprise. We should also constantly be developing new ways to educate our young people and to reduce or eliminate populism and extremism. These things have a strong impact on research. Who but the best

brains in the country is capable of developing effective solutions? Who cares more than they do about the education of our people?

LÁSZLÓ LOVÁSZ

I was asked to briefly summarise what happened at the Hungarian Academy of Sciences. A year and a half ago, the Minister of Innovation and Technology basically redirected two-thirds of the Academy budget to this new ministry. In particular, the funds intended for maintaining the research institutes were cut. There was a long fight. Eventually, this summer, a law was passed separating the research institutes from the Academy. A new system was formed, and now we are trying to live with the situation. A research network that is separate from the Academy does sometimes work; it works in many countries. The problem is that questionable methods were used to get to this point. For one thing, the ministry did not present concepts or plans or even just arguments for these changes. Their justification was the need to increase innovation in our country. I myself worked for Microsoft for seven years, I have sev-

eral patents, and the Academy had started a number of cooperation projects with industry: for example, our joint scholarships initiative. The new network’s president, however, was from Arabic studies. The “supporting innovation” argument had no basis whatsoever in reality. In any case, we now have to live with the situation. We decided to change the Academy’s mission. In a few weeks’ time, the new mission statement will hopefully be approved by our general assembly. Out of its seven points, I would like to pick one: the Hungarian Academy, as a learned society, shall provide a common forum or platform for all science.

One accusation against the Academy is that, supposedly, it’s a club of old people, some of whom, – so the argument goes – still do research, but most of whom do not. Instead, they spend their evenings playing tarock or chess. In reality, the Academy is much more than that. There have been a number of developments over the last decades. We have a body of about 17,000 people. Anybody with a PhD and Hungarian nationality can join. This body elects representatives to our general assembly. There are 200 representatives, more than a third of the general assembly. This is

one age group in that these members usually are younger, maybe in their fifties. However, there is considerable variance. Our last general assembly established a Young Academy like those in many European countries, which are affiliated with our Academy. There are other groups of younger people who support the Academy. There is, for example, an academic scholarship that is midway towards ERC grants: the grant is around half of an ERC Starting Grant, the number of recipients is 2 to 3 times the number of ERC grantees in Hungary, and quite a few recipients go on to win an ERC grant. The recipients of this grant have come together over the last year to help the Academy in the dispute I mentioned above. Well over a hundred of our best young scientists teamed up to support us. It is therefore very important to create a forum for different generations of scientists, and also for the whole range of research institutions from basic research to applied research and from natural sciences via social sciences to humanities. Tensions and disputes and sometimes even accusations might surface, which can then be discussed and hopefully resolved at this level rather than in the press or within smaller environments like

universities, where local bias and personnel issues come into play. So academies are needed because the research community, scientists, and scholars of all generations and from all fields need a forum where they can get together and exchange ideas. I consider this to be the most significant of all the Academy's missions.

PETER MOCZO

Do you think that this unprecedented and unreasonable measure of separating the research institutes from the Academy is a consequence of populism in politics?

LÁSZLÓ LOVÁSZ

I would not call it populism. I do not think the public cares about such, for them, minor issues. There is conjecture about the reasons. I can only speculate.

ZDENĚK HAVLAS

I am here as a representative of both entities in our country: the Czech Academy of Sciences, and the Royal

Society as its former president and current vice-president. The Academy of Sciences is an association of more than fifty research institutions. It is supported by the State with an independent chapter in the federal budget, and currently it is supported reasonably well. This allows us to perform research in all branches of science. We are ranked fourteenth in the Nature index in the natural sciences, which is not bad for an institution established in 1953.

The Royal Society is much older. It was established over 200 years ago, during the reign of Emperor Joseph II, and not for the purpose of active research. It has always been an association of roughly a hundred selected highly educated people. The work of the Royal Society was interrupted twice: during World War II and during our socialist period; it was re-established after the Velvet Revolution. According to the law, the Royal Society is supported by the Academy of Sciences. The Academy and the Society are located in the same building, with the Royal Society renting office space from the Academy of Sciences. The Academy of Sciences pays an annual amount for the work of the Royal Society, which makes the Society relatively stable.

What is the role of the Royal Society? As has been mentioned, it brings together the country's best scientists under one roof. In the opinion of some of our older Society members, its aim is to make recommendations to the country's research institutions and policymakers. The younger generation would like to add aspects of current politics to the work of the Royal Society: for example, migration or refugees. To take one example, the younger scientists organised a set of open discussions together with the German Embassy and the Swiss Embassy, which were very well attended. This internal discussion is still going on. About half of our members would like the Society to stay out of politics. The other half would like to open the public debate to socially relevant political hot topics.

Back to the Czech Academy of Sciences. I mentioned that the Academy is supported by the State and has its own chapter in the budget. That does not mean that our budget situation is always stable. Ten years ago, the Academy of Sciences was under attack from members of the government, universities, and industry representatives who wanted to close it. It was the time of the economic crisis. We were fighting for

resources. During this difficult time, the Academy of Sciences and the universities did not move in the same direction. There was conflict between the science institutions: universities versus Academy. We survived, but it took about eight years to get back to the original budget and to stabilise the Academy.

Today the situation is stable. The Academy is treated well by the government. We are cooperating with parliament and with the Senate. But still, a new crisis is bound to come some time. We may once again face difficulties; we may once again have to fight for our survival. For now, our aim is excellent science, and in some respects we are doing well. Many of our institutions are among the best world-wide. We had two Nobel Prize nominations in pharmacology, which did not succeed mostly because they could not be clearly assigned to either chemistry or medicine. Nonetheless, we developed a set of treatments for major diseases, the HIV virus among them. 99% of newly treated AIDS patients receive a drug that was originally developed at the Czech Academy of Sciences, saving the lives of tens of millions of people, and granting them a normal lifestyle.

PETER MOCZO

To clarify: the Czech situation differs significantly from the Slovak situation in that the Czech government sufficiently supports research and science education, at least at the moment?

ZDENĚK HAVLAS

Exactly. The budget of the Academy of Sciences is more than enough for our fundamental research. Counting in external funding from national and international grant agencies, we can achieve excellent research. We communicate well with the policymakers and we have a say in their plans.

DANUTA SHANZER

Ci-gît qui ne fut rien, même pas académicien. "Here lies someone who was nothing, not even a member of an academy." This inscription on a bust of Alexis Piron in the Musée des Beaux-Arts in Dijon was too apposite not to share, when those in the room are fellows of academies, even fellows of many academies: *Dr. Dr. habil. hc mult.*, etc.

Let me start with my background. I am an American with an English doctorate who has taught in several different countries. I will not be talking exclusively about the Austrian Academy.

What kind of an entity does one have in mind when one thinks “academy”? Academies are multifarious and radically different in different political systems. Some are professional dues-paying organizations with an additional *Gelehrten-gesellschaft*.¹ Some cover narrower areas; some cover broader or multiple areas, such as the National Academy of Sciences,² American Academy of Arts and Sciences;³ others are government-supported national academies that in some sense represent a country. The latter have different structures.

Perhaps the only irreducible ingredient for an academy or learned society is a competitively elected fellowship (even though there can be processes of adlection too). A place or real estate is optional: some academies are virtual. Academies have journals, series of publications. Some (like ours)

have their own presses. Academies hold deliberative business meetings both in the *plenium* and in subgroups (often alternately boring and contentious); also scholarly meetings where research is presented and shared (not boring). Presenters before the *Gesamt-sitzung* have to be able to speak to a broader public; in the *Klassensitzung*, lectures can be more technical.

In late 2012, major surgery was performed at the Austrian Academy of Sciences to separate what were seen as problematic conjoined twins. We now have many research institutes with employees (*Forschungsträger*) who are not coterminous with the Fellows. And we have a deracinated *Gelehrten-gesellschaft*. Not all are happy with the outcome of the operation.

The Austrian Academy of Sciences also has a Young Academy. Not every academy has one. I have mixed feelings about such bodies. Do they promote ancestor worship or perhaps institutionalise a kind of patronage system (*Seilschaften*), or spoil certain people when a halo descends on them at a very young age? I have concerns about the criteria used to adlect members, which exclude scholars who do not work in teams and for whose fields there

are no official prizes, i.e. most humanists. There speaks the outsider! I do however think it very important that academies fund scholarships for younger people, including those who have nothing to do with said academies. The British Academy has always done that, awarding short-term research grants for graduate students and postdocs.

European academies support big grants and collaborative projects and employ people who, in the US, would only have found employment as scholars *and* teachers, not as pure researchers. I would like *pro domo* to add that an academy is the safest home for long-term humanities projects. In my fields we number many such: for example, the *Acta Sanctorum* of the Bollandists in process since the seventeenth century under the Jesuit aegis.⁴ Also the *Monumenta Germaniae Historica*,⁵ the *Mittellateinisches Wörterbuch*,⁶ and the *Thesaurus Linguae Latinae* at the Bavarian Academy,⁷ the

⁴ <https://www.bollandistes.org/the-bollandists/>

⁵ <http://www.mgh.de>

⁶ <https://www.mlw.badw.de/das-projekt.html>

⁷ <https://www.thesaurus.badw.de/en/project.html>

¹ E.g. The Medieval Academy of America.

² An NGO.

³ An NGO.

(shorter term) Dictionary of Medieval Latin from British Sources at the British Academy,⁸ and (alas) the *Corpus Scriptorum Ecclesiasticorum Latinorum* that was sadly de-accessioned by the OeAW in 2012 to resurface in Salzburg.⁹ I am not envisaging a life-support system, but a hothouse. Universities, sadly, live from one rector and one dean to the next.

Academies are also clubs of a sort. Some had their origins bottom-up from groups of intelligent people who liked to talk to other similarly intelligent people. One person could run a salon; groups formed societies. Consider the American Philosophical Society founded in 1743 “to promote useful knowledge”.¹⁰ Having a place can make an immense difference. We at the OeAW are extremely grateful to the *Praesidium* for the electronic cards that grant us access to the *Mitgliederbereich*. Some of us fantasize about a place that could eventually approximate the late-lamented American Faculty Club or an Oxbridge Senior Common Room ... A place permits

informal exchanges with colleagues which are arguably more important than the addresses or posturings in formal meetings (think *hohe Akademie*).

Academies should always have to be considered within the context of neighbouring universities. The dynamic between these institutions can make up for weaknesses or problems in one or the other. One example. At the University of Vienna, the faculties are so large that they never meet together to deliberate. (There are even disadvantageous barriers between the *Kurien* for history and philology!) As a result, I would never set eyes on or speak to a “hard” scientist if I didn’t frequent the OeAW. This situation is a regrettable social and intellectual loss, but also potentially an academical political one. In America, the faculties of Liberal Arts and Sciences meet and deliberate together and, when necessary, help one another. This is an intellectual and social gain for all concerned that, in addition, strengthens our collective ability to control rampant administration.

Another valuable function of an academy is that it has a place for people over sixty-five. In countries that discriminate based on age by enforcing mandatory retirement – not

all countries do – academies enable experienced researchers to apply for grants, or have an office, or mentor postdocs, or continue to perform research that requires more than a home office. These are local reasons academies matter.

Amongst the general public, there’s little understanding about academies. One dreads to think what the average American might say if asked what he or she thought went on in one. From the perspective of the universities, academies are elitist – let’s face it, that’s the point. Some detest the idea, or feel excluded or resentful. Others claim that the list of those who failed to be elected to the Austrian Academy or to become fellows of All Souls College is far more distinguished than the list of those who did. Sour grapes? László Lovász mentioned “the society of old people”. I need hardly tell you that women (and minorities) might simply say, “Old (white) men’s club”.

Many European academies concentrate on large grants and collaborative research. American academies tend to think more in terms of individuals rather than groups. There is, moreover, a real tension between the support of outstanding individual scholars and scientists and what can

⁸ https://en.wikipedia.org/wiki/Dictionary_of_Medieval_Latin_from_British_Sources

⁹ <http://cseel.sbg.ac.at/en/>

¹⁰ <https://www.amphilsoc.org>

be done for society by an academy. Academies can also be lighthouses, goals, places of aspiration, dreams. People who look at them may think, “Yes, I might become one of them one day”. Sometimes an academy must just exist, be there, and be a repository, like dormant microbes that can – I don’t mean that in a negative way – come into active life if there’s political trouble and minds are needed who are ready to respond. I have been thinking about interventions, for political situations around the world are parlous. In my own country, the situation is appalling. It would be wonderful to have academies intervening with public statements about things like creationism, immunisation, or climate change. The Austrian Academy spoke out about homeopathy in a *Stellungnahme* that emerged from the *Gesamtsitzung* of November 2017. I expect that academies will increasingly be asked for opinions about scientific matters that have become political issues.

PETER MOCZO

Your contribution was an interesting essay on different types of academies and their roles. To summarise, what

would be your most fundamental statement about a learned society that represents the best scientists in a country? What would be the primary purpose of such a collection of a country’s best brains?

DANUTA SHANZER

It should be active. It is important to pursue a variety of approaches. It should advise the government. It should support the research of its members, who in turn will enable and improve the research of others. Members of academies do enormous amounts of evaluation by the time they are at that professional level: likewise an important function. Another is outreach. The OeAW has a project with comics, and the word “school” has been mentioned. I am not sure how well that worked. That is perhaps something I would prefer to see the universities doing (*KinderUni*). There is a chain of command; the universities should be talking to the schools, and maybe the Academy need not be talking to the schools. Academies need to deal with their governments. That is the next item that is coming up. If we look at the history of academies that did

not deal with their governments at certain key times, we find reason for concern.¹¹

ROMAN SŁOWIŃSKI

The question about the role of academies is also highly topical in Poland. We have been redefining our identity and our position throughout the last thirty years of transformation. The Polish Academy of Sciences rests on three pillars. The first pillar is the corporation of elected scientists, 350 Polish and 180 non-Polish, representing all disciplines across science and humanities. It is accompanied by thirty-five members of our Young Academy. The second pillar encompasses the sixty-nine research institutes spanning all five divisions of the Academy. We can view the seventy scientific committees with about forty members each, elected democratically from among Poland’s best scholars in all fields of science, as the third pillar. I will come back to their capacity for answering the difficult

¹¹ A recent exhibition studied the tragic events at the OeAW during the Nazi period. See <https://www.oeaw.ac.at/detail/news/dunkle-zeiten-auch-in-der-wissenschaft/>

questions of our times after briefly describing our sixty-nine research institutes. The efficiency of these institutes is relatively high, particularly in relation to their funding. Our estimates show that if these sixty-nine research institutes had one label, like one university, it would be placed among the top 200 research institutions in the Shanghai ranking, while our best universities in Poland are only rated in the top 400. The three pillars of the Academy are interrelated through various connections. The strongest relations exist – or should exist – between the corporation and the institutes.

This marriage is not always a happy one. There are various reasons for this. Firstly, the institutes were created around certain members of the corporation in the course of the last sixty-five years. The situation today is different. Many institutes don't have any academy member on their staff. Moreover, the institutes are granted a certain degree of autonomy by law, and they are very sensitive about their independence. Currently, they are financed directly by the Ministry of Science and Higher Education. Their budget does not have to be approved by the Academy president. For this and other legal reasons, the

president and the corporation have limited control over the institutes. The institutes would certainly benefit more from a stronger connection with the corporation. To speak frankly, the trend of institutes gaining independence from the Learned Society may bring them into the direct control of the ministry, which might undermine their autonomy; for example, by prioritising funding for applied rather than basic research. Experience indicates that innovation in applications is preceded by a high level of basic research. This strong correlation is easy to observe in countries that assign a comparatively high budget to basic research.

Now, what is the role of the Academy? One could invert this question and ask what a country can or should expect from academia. The role of the research institutes is straightforward: to perform research in order to advance knowledge. The role of the learned society – the corporation and the scientific committees – would be to give expert advice and to help governments in setting priorities for research and education. The lack of such priorities leads to problems: for example, the brain drain that was mentioned by a previous speaker. Brain drain is a significant problem in

Eastern and Central European countries. In recent years, the number of gifted Polish students embarking on a research career, particularly in engineering sciences, has decreased significantly. This is because PhD grants and scientists' salaries paid by Polish research institutes are considerably lower than comparable grants abroad, as well as local salaries in relevant professions, for example IT.

I now come to the advisory role of the Academy. The Academy is prepared to give expert advice, but this can only be effective if politicians show an interest in this kind of support. And, over the last thirty years, our politicians have exhibited a profound lack of interest in the Academy's assistance. On many occasions, reform packages planned by the government – even when these directly concerned science – were developed by governmental task force teams with no academy members on board. The potential of the Academy is not being fully used. This situation needs to change. Recently, there have been extensive reforms of higher education and research in Poland, with new regulations that directly affect the Academy. For this reason, we prepared amendments of our legal statute, which we have proposed to the

government. The focus of our proposal is on strengthening the connections between corporation, institutes, and scientific committees. This will augment our presence in society. The union of corporation and institutes needs to be preserved.

OTO LUTHAR

I will start with a very brief presentation of the Slovenian Academy of Sciences and Arts, in particular its status and its role. I will skip the details and focus on some legal aspects and basic elements of the collaboration and cohabitation between the Slovenian Academy of Sciences and Arts and the Research Centre of the Slovenian Academy of Sciences and Arts. This is the centre I am working with. I will talk about this cohabitation, not just in terms of shared buildings or joint research on Slovenian culture and natural heritage, but also with regard to a number of scientific publications. What is interesting about the Slovenian Academy of Sciences is that certain changes – like the ones mentioned by my colleagues from other academies – started as early as the 1980s. First, special legislation was introduced; and then, after the

democratic changes in 1994, the law on the Slovenian Academy of Sciences and Arts came in. This specific law further formalised the relationship, not just with the Research Centre of the Slovenian Academy of Sciences and Arts, but also with other institutions. In a nutshell, the Slovenian Academy is not an academy with research institutes, but rather an academy for universities and institutes. Other academies in the area of former Yugoslavia, like the ones in Zagreb or Belgrade, were not subject to similar changes. The Slovenian Academy is a singular case.

I now come to the question of whether the Academy has support from politics and the real sector of the economy. The answer is a clear no. Even though, in the public eye, scientists rank in second place right after firefighters, politicians and representatives of the real sector view science as a luxury we cannot afford. This especially true for smaller countries in the periphery. Currently, research in Slovenia is funded with 0.4% of the GDP, one of the lowest figures in the EU28. At this point, I would like to leave funding aside and focus on how the academic environment in Central Europe is viewed from the outside.

At the opening of the European Sociological Association conference three months ago in Manchester, the president of the association, Sue Scott, addressed the current tendencies of undermining sociological knowledge. When I mentioned to her the closing of the gender studies program in Budapest, she cited the explanation given by the Hungarian government, including their wailing about the two natural sexes, which I am certain you are all familiar with. In a time when gender is once again being defined by nature alone, in a time of neo-populism and rising xenophobia, discussions of the role of academies either as learned societies or as clubs of distinguished researchers have become extremely important. As this is not a sociological convention, I will focus on the issue of autonomy. Research autonomy that has been under threat for years. Autonomy is something that academies can, even must, guarantee and secure, not only for their members but also for researchers in general; and probably not only for researchers. I would like to suggest some explicit purposes and roles for the Academy. Firstly, we should ask academicians to step out of their comfort zone. I think we all must be willing and able to discuss the dark

areas in the history of our nations and of Europe. Academies must be alert to the pulse of their respective countries, but also of Europe as a whole and its regions.

We live in strange times in terms of political language. We have the tweeting and twittering, bubbling and hissing media. Within these media spaces, there is little room for language at its best, language as it is used in academies. Academies must remain the places where new initiatives and innovative approaches are discussed and tested. Academies are expected to be critical, creative, provocative, and engaged, while being aware of the old wisdom: “Unless you are going forwards, you are going backwards.” Academies, therefore, have to remain in flux. They must always change, and hopefully they always will. Nevertheless, the sciences, and the arts as well, are at the centre of the most crucial guarantees of our being human, as the British poet Carol Ann Duffy put it.

AUDIENCE SPEAKER 1

What I have been missing in this debate is the role of an academy as a representative for the national re-

search landscape across Europe and outside of Europe.

DANUTA SHANZER

Take the Austrian Academy of Sciences. As an entity, it is the result of a historical process. In its current form, it has been shaped by people who have been powerful over the last 10 to 30 years. Sometimes the continuities go back 140 years. So, you might look at the Academy and see a first-rate international institution, where individual projects may have started as a cottage industries in Austria in 1860. Some have done what they do better than anybody else and have been active from then until now. The OeAW represents the research of individual scientists. That research may or may not be distinctively Austrian in nature. Often the research here does not concern Austria. It may trace its history to some distinguished person’s research on Central Asia, for example. It may reach out to other academies in different countries, as when *Mitarbeiter* work at a sister academy: the OeAW collaborates with the *Mittellateinisches Wörterbuch* and the *Thesaurus Linguae Latinae* at the Bavarian Academy.

AUDIENCE SPEAKER 1

I understand that the Academy of Sciences in Austria connects national research institutions, universities, and others. There are research collaborations and things like shared professorships. The Academy has a decent overview of what is going on in Austria. This makes the Academy a suitable representative of Austria’s research activities to others outside Austria, other European institutions, or governments.

PETER MOCZO

According to our regulations, the Learned Society of Slovakia has the duty to represent Slovak science to the rest of the world.

LÁSZLÓ LOVÁSZ

In Hungary, we have always considered our Academy the main face of Hungarian science abroad. The World Science Forum, which will start a week from now, is one example of this kind of effort. The opposite procedure, however, is also important. Many reports about science,

but also about the economy, reach the National Academy of Sciences, and these should be communicated to the people. Just as we represent Hungarian science abroad, we should also present international science to our own country. I must admit we haven't done that yet.

AUDIENCE SPEAKER 2

Since five of the representatives at the table are from post-communist countries, and acknowledging Professor Luthar's initiative in mentioning autonomy, I wonder if you see any danger in these post-communist countries as to the autonomy of the academies or learned societies, as to the autonomy of doing research? I can give you one example from my country, Hungary, where the government banned gender studies at all universities, including even private ones.

PETER MOCZO

Your question is whether we are facing threats of having research autonomy reduced or even having research topics prohibited by the government?

AUDIENCE SPEAKER 2

I can give you another example besides gender studies: for example, climate change. This is a burning issue and, in some countries, politics does not support the majority of scientists in this field.

PETER MOCZO

In Slovakia, we are facing increasingly aggressive pressure from business to focus on research directly requested by industrial production. They are not aware of the relations between free academic research, applications of that free academic research, and applications required directly by industry. They are pushing to establish legislature which would help promote their interests. The rectors of the universities and the president of the Academy are preparing an urgent response to explain that, even in our small nation of five million people, it is not possible to prohibit free academic research and instead direct our talented brains to a small range of predetermined research goals. The next Einstein might be from Mongolia or from Sudan. We need to remember this.

ROMAN SŁOWIŃSKI

There are some similarities between Hungary and Poland. Our present government can be qualified as conservative. Its conservative attitude does not, however, affect the freedom of research. Throughout the last four years, under this conservative government, official policy was even more flexible because the new reform of science and higher education mentioned above gave universities more freedom than they previously had. The institutes of the Academy are as autonomous as the universities. At the same time, the love of autonomy and freedom that is pushing some researchers to contest supervision of the Academy institutes by its president may paradoxically lead to greater dependence on the government, which would be detrimental to autonomy.

OTO LUTHAR

In Slovenia, the autonomy of research is not really in any danger. I am glad we have witnessed no shutting down of university courses, although occasionally certain research institutions have been subject to political inter-

ventions; not by the government, but by political parties. When I say interventions, I mean the spreading of the prevalent anti-intellectualism. The Slovenian Academy not only provided autonomy for the institutes that had been part of the Academy, it always kept the issue of researcher autonomy at the forefront, too. Not just in the 1990s, but as early as the mid-80s – you are probably familiar with the situation in former Yugoslavia – a powerful alternative movement took place in Slovenia, in particular, in which the Academy was involved. Some of the meetings took place on Academy premises, and the person who suggested the creation of the Committee for the Defence of Human Rights in the mid-1980s was a member of an Academy institute. By then, the Slovenian Academy was already a safe haven for such important discussions. It seems strange that such a strong structure would come to such a drastic end; never say never.

AUDIENCE SPEAKER 3

You mentioned the interplay between basic research institutions and industry. This is an issue in Austria as well. I suggest entering into a di-

alogue between research institutions and industry. Research institutions have certain things to offer, and industry has certain demands. There are things industry does not consider when pressuring basic research institutions towards applied sciences. Basic research institutions may not be aware of certain needs of industry. If we initiate such a dialogue, we will probably be able to reduce this tension.

PETER MOCZO

I agree. Today, we discussed with the President of the Slovak Academy how, in January, we will meet with the captains of our industry to educate them about our free basic research. The same free academic research which led, for example, to the discovery of the electron. A discovery like that would never be requested by industrial production, but the amount of revenue generated by applications based on this discovery is enormous. Discoveries made in the process of investigating the physics of black holes have resulted in practical applications today. The type of research directly requested and formulated by industry is based on the needs of

industrial production, which is also important. If you speak to politicians, ordinary people, and representatives of business or industry, you find that there is little awareness of all this in Slovakia. Raising this awareness is a vital task of and challenge for the Academy.

ZDENĚK HAVLAS

The interaction between academia and industry is a very special topic. I would perhaps not call it a dialogue. The Czech government recently developed a strategy package supporting different ways of using intellectual property generated by academia, including goals, strategies, concrete measures, and financing options for programs of the growth agency. We have heard several success stories. Industry – not only Czech industry, though that is the focus of the Czech government – and academia have been interacting. Researchers have offered intellectual property to industrial partners, who receive it eagerly and ask for more. This is an ideal situation. It is a high-risk business; not everything can be successful. Not only does it support the distribution of cutting-edge technol-

gies to society, but it also turns out to be an important source of income for research institutions. If successful, that income can be substantial. At the Czech Academy, we would like to take that a step further. The government is also approaching academies and universities, to exploit the full potential of intellectual property that might be of benefit to society.

AUDIENCE SPEAKER 4

In post-communist countries, the academies inherited the Soviet system of awarding scientific degrees, which is different from Western European countries, where the universities confer these degrees. We like the Hungarian system because we feel that the Academy is able to maintain higher standards than the universities. I wonder what the situation is in the other countries.

PETER MOCZO

In Slovakia, we have a variety of academic degrees. The only one that correlates with quality and impact of research is the highest scientific degree, Doctor of Science. This is one

order higher than an international PhD. Slovakia produces hundreds of professors who are unknown at the other end of their own corridors. The Doctor of Science degree is still a reliable indicator of scientific quality. This does not mean we don't have good professors. Out of a hundred professors, typically five will reach the level of Doctor of Science. The criteria are derived from international statistical benchmarks.

ROMAN SŁOWIŃSKI

In Poland, we got rid of the Soviet system of graduation in 1956. Since then, we have the doctorate, the post-doctoral lecturer qualification and the title of professor. According to the new reform, if the conditions are met, the doctoral degree and the postdoctoral lecturer qualification can still be awarded by Academy institutes as well as universities.

CONCLUSION PETER MOZCO

Probably the most concise formulation of the fundamental purpose of a learned society can be found on the

website of the Royal Society: "to recognise, promote and support excellence in science and to encourage the development and use of science for the benefit of humanity."

There is no doubt that this is correct and very succinct. However, fulfilling this purpose of learned societies in reality poses considerable challenges in many countries. The conditions and traditions concerning the appreciation of science, research and education differ widely, as do recent problems in those countries.

I will briefly mention two countries that are very different in terms of the conditions for science. Scientists in the Czech Republic are more or less satisfied with their level of governmental support. In Slovakia, neither politicians nor society at large understand that science, excellent research, and good quality education are necessary conditions for reasonable and sustainable development and the survival of humanity as a whole, but also of individual countries. This is especially interesting because, for a long time, the two countries had a similar development.

We also discussed the fact that a sound tradition of science support in a country does not guarantee the satisfactory continuation of this tra-

dition. Hungary and the Netherlands are examples of this phenomenon. We also mentioned that, understandably, there is an ever-present potential for overestimating the applied research directly requested by industry and neglecting the fundamental importance of free academic research.

We also mentioned the need for improving the education of young people in order to reduce or eliminate populism and extremism. Who other than the best brains in the country should care about the level and quality of education, which can prevent many negative political and societal developments?

I will now refer to some concrete ideas by panellists and colleagues from the audience. Learned societies and academies serve as a forum for the exchange of ideas. The learned society should be active in advising society and government in funding research, evaluating other people's work, and supporting talented people.

Another good point was that a country may expect academies to perform research that is beneficial for the country. The flipside is that, where there is no adequate support from the government, the intellectual potential of scientists is not reasonably and

sufficiently exploited for the benefit of society, nation, and country.

A warning was issued to the effect that, in some countries, science is seen as something we cannot afford.

The challenge for the learned societies is to convince and educate decision-makers in society, politics, and industry. The learned society should communicate the results of national research in order to educate the nation.

The learned society should also protect the freedom of academic institutions and research. As my final remark, it is very important to strengthen dialogue between the learned societies and industry.

PETER MOCZO, *Seismologist and Professor of Physics at Comenius University in Bratislava, Current President of the Learned Society of Slovakia and Chairman of the Slovak Commission for Scientific Degrees.*

DANUTA SHANZER, *Universitätsprofessorin für lateinische Philologie der Spätantike und des Mittelalters at the University of Vienna from the Austrian Academy of Sciences.*

ROMAN SŁOWIŃSKI, *Vice President of the Polish Academy of Sciences, Professor and Chair of the Laboratory of Intelligent Decision Support Systems at the Institute of Computing Science, Poznań University of Technology, member of Academia Europaea, and fellow of IEEE, IRSS, INFORMS and IFIP.*

ZDENĚK HAVLAS, *Vice President of the Czech Academy of Sciences, Honorary Chair of the Institute of Organic Chemistry and Biochemistry.*

LÁSZLÓ LOVÁSZ, *President of the Hungarian Academy of Sciences, is a mathematician best known for his work in combinatorics, graph theory and theoretical computer science, for which he was awarded the Wolf and the Kyoto Prizes, among others. He was professor at Yale University, a collaborative member of the Microsoft Research Center and the director of the Mathematical Institute of the Eötvös Loránd University. He received both the Advanced and the Synergy Grant of the European Research Council.*

OTO LUTHAR, *Director of the Scientific Research Center of the Slovenian Academy of Sciences and Arts, and a member of its Institute for Culture and Memory Studies. His research interest include modern history of ideas, social and culture history. He is the author/editor of The Land Between: A History of Slovenia, Of Red Dragons and Evil Spirits: Post-Communist Historiography Between Democratization and the New Politics of History, and The Great War and Memory in Central and South-Eastern Europe.*

PANEL 5

DIRECT DEMOCRACY

Chair:

Andrzej Rychard, PAN

Panellists:

Tomáš Kostelecký, CAS

Simona Kustec, SASA

Anna Kende, HAS

Gabriel Bianchi, SAS

Sonja Puntscher Riekmann, OeAW

ANDRZEJ RYCHARD

The topic of direct democracy deserves our attention. What were and are the reasons for the growing popularity of the concept of direct democracy? It is certainly a response to the crisis of representative democracy, which is marked by phenomena like the alienation of political parties, but also the oligarchisation of parties and of other forms of political representation. The demand for direct democracy is expressed directly and vividly by certain communities. We might ask whether this demand is not just the response to the problem, but also part of the problem itself. The question is to what extent direct democracy has the potential to solve the crisis of representative democracy, or to what extent it might exacerbate the problem.

Some difficulties are due to the preconditions for direct democracy and the ways in which it is implemented. We must consider historical tradition and context. Direct democracy, just like other forms of democracy and non-democratic regimes, is highly path-dependent. It may function well under some historical conditions and fail under others. I would like our panellists to address the question of

to what extent history matters, and whether it is feasible to implant direct democracy in social, economic, and social-political “soil” which is not prepared to have it take root. Would it work in these conditions, or not? The answer is not straightforward. Before we introduced market democracy in post-communist countries, right after the collapse of communism, many voiced the opinion that it would not work because the soil was unprepared. And yet, at least in some countries of the region, it functions very efficiently. Path dependence is something to be overcome. History does matter, but it is not driven by pure determinism, either.

The next question is about the relationship between direct democracy and decentralisation. This is strongly related to the problems of the social and historical traditions. Is it possible to introduce direct democracy in countries without strong traditions of decentralisation? Is decentralisation a prerequisite for mechanisms of direct democracy?

I would also like to address questions about the context within which direct democracy can function. We are witnessing an increase in complexity in our world, and therefore also in the

decisions that have to be taken in the public arena. In this world of growing complexity, it might be difficult to arrive at rational decisions using methods of direct democracy. Parallel to that, we are witnessing the process of what Zygmunt Bauman called “glocalisation”: localities are directly interconnected with global structures through social media, information technology, the internet, and various forms of networking including network communication. This increases the ability of the local to connect directly with the global without an intermediary structure like the nation state. I am exaggerating. However, this might be an additional factor in the growing importance of direct democracy, which is also about linking local with global in a more direct way.

I would also like to discuss to what extent direct democracy mechanisms might be able to mitigate or moderate the effect of general social-political cleavages within a given country. This to some extent reflects the experience of my country, Poland. The authors of some very well-articulated and well-prepared ideas of decentralisation in Poland, concepts which to some extent relate to direct democracy mechanisms, believe that

this is the way to deal with highly polarised political structures and with certain deeply rooted political cleavages within a society. Direct democracy and decentralisation: would this work or not? What would be the consequences of direct democracy mechanisms in terms of mitigating political cleavages?

I would like our panel to address the issues around the reasons why the concept and the mechanisms of direct democracy are re-emerging or regaining popularity, and the possible consequences of this. However, please feel free to set your own focus. That is the direct democracy element of our panel. That said, I hereby declare that I will adopt direct autocracy in chairing this panel. I suggest that, in the first round, each panellist address the issues relating to the causes of and reasons for direct democracy. In the second round, please discuss the potential consequences. After that, I would like the audience to participate as the sixth panellist. I hope that all our panellists will address the issue from two perspectives. Firstly, speaking in more general, universal terms. Secondly, I would strongly encourage each of you to refer to the experience in your own country.

TOMÁŠ KOSTELECKÝ

You have laid out many complex questions, and we have little time. I will be brief. I agree one hundred percent that the concept of direct democracy is on the rise. Its popularity is increasing dramatically across the globe. The main reason for this is simply disillusionment with the performance of current democracies, which are mostly representative democracies. At the root of the problem is the crisis of political parties. Memberships and trust in political parties are decreasing everywhere, regardless of cultural differences. And people are not satisfied with how political parties are representing them. They are looking for other ways to attain representation of their interests. It has been empirically proven that increasing distrust in political parties goes hand-in-hand with the appearance of direct democracy concepts.

I would like to point out that the issue of representative democracy versus direct democracy is not an either/or option, but a continuum. Direct democracy – for example, when people in a small community in Switzerland meet in the village pub to discuss an issue and take a vote –

is very rare. Typically, direct democracy principles are combined with methods of representative democracy. An effective implementation of direct democracy methods might be very different from what is currently being discussed. There could be different kinds of direct democracy, and different uses of direct democracy.

In the Czech Republic, we have no referendums on the national or regional levels. The law only allows them on the local level. The legal thresholds for a referendum are high and difficult to reach, so it is rarely done. We in the Czech Republic are not used to direct democracy.

SIMONA KUSTEC

Before I come to the situation in Slovenia, I have some general comments. I am an enthusiastic advocate of democracy. Democracy is the only option for politics and society.

I am more careful when I speak in favour of direct democracy. Why so? We have historical memories of and experiences with direct democracy that turned out to be less than positive. Now, what are the reasons behind the current discourse on direct democracy? Is it connected

with dissatisfaction with politics and political institutions? Is the point of contention democracy in general, or does it concern specific political entities, especially political parties? From general systemic questions, we can go into specific, micro types of questions. Can direct democracy solve any of these problems? Are we going to gain trust in politics, in democracy, in political institutions through direct democracy? I do not think so. The problem of trust and confidence in politics, in democracy, and in political institutions is ubiquitous. It is just a question of how to address the real reasons behind this. I agree with Tomáš that the essential root of mistrust, distrust, and dissatisfaction in democracy today lies in the role of political parties as mediators between voters, principles, and political institutions as the agents that work for the people. The parties play the system to achieve their goals and interests and to justify their actions. Countless problems stem from this dynamic. If there is time, we can discuss them in more detail.

One of the reasons for the contemporary debate about direct democracy is its capacity to serve as a potential new political weapon or propaganda mechanism for new parties, new

players working to gain public interest, who may set their focus on challenging existing structures.

In terms of the implementation of direct democracy methods, Slovenia is number one in the Central Eastern European region. Since our independence in 1991, we have had seventeen referendums. Except for the plebiscite on independence and the referendums on entering the European Union and NATO, these were big and shameful failures. I am a political scientist, and I contend that these referendums were misused as political weapons by political parties to gain influence.

ANNA KENDE

I am a social psychologist. I look for universal processes in the reasons why people do things. From this perspective, I see direct democracy in a broader sense, not limited to referendums but also in terms of social movements, engagement in politics, social responsibility, and other forms of political participation. I see two main issues that refer to universal processes but are also relevant for the region and for Hungary specifically. One is the decentralisation process

that has taken place, not just because of the erosion of the current political elites, or political systems, or representative democracy, but because of the ways we communicate today and the structure of our social networks. We no longer need centralised bodies to organise a protest or participate in a demonstration; we can rely on our existing social network for that. In terms of the psychological impact of this change in organisation, the social psychology term for actions we participate in to benefit the larger group used to be “collective action”. It was renamed to “connective action” to reflect that it builds on existing connections, but also that identities are developed through engagement in social media, participation in group discussions, and so on. Politicised identities are vital for any engagement, but the speed at which these politicised identities can develop has changed in the context of social networks. This is a significant and positive process as it has increased awareness of social and political issues. The success of many recent referendums is in a large part due to successful mobilisation within existing social networks. Recently, the residents of Budapest voted against signing up for the Olympics by bidding on

the authorisation to host it. This led to the formation of a new political party. So I agree that political parties use and misuse referendums for their own end goals. What is even more severe in the context of the region, and Hungary specifically, is the profound coalescence between psychological demands in the context of the lack of sovereignty in our history, which meant living in fear of extinction – cultural, linguistic extinction. Territorial threats have been very much part of our history. The resulting instability inflated nationalism. National identity requires continual reinforcement. It constantly has to be defended against external threats. By that I do not only mean threats from other countries, but also perceived threats from anybody with a different opinion.

This represents and critically reflects some of the political trends in Hungary. The psychological demand at the root of nationalism that is typical for the region is a result of these complicated histories. That demand aligns with the emergence of new forms of eroded democracy, where political leaders appear as – we might use Reicher’s expression – ‘entrepreneurs of identity.’ No longer does a classical political leader com-

petently provide vision or manage a country. Those new figureheads present themselves as members of nationalist groups and as defenders against any external threat. This powerful coalescence between the demand of an insecure sense of who we are and what our role is in Europe, or in the region, and the emergence of a new right-wing populist leadership, creates ... I’m reluctant to call it the current face of direct democracy. However, we do see that some of the mechanisms we used to refer to as direct democracy are being instrumentalised by right-wing populist leaders to gain influence.

SONJA PUNTSCHER RIEKMANN

I would like to start by pointing out a paradox. This also draws on what Tomáš and others have said on the panel. Those who promote direct democracy are the same people, generally party leaders, who decry the fact that representative democracy is in crisis. This is an interesting situation. What do we make of it? Simona said, challenging representative democracy in the name of listening to the people. I shall leave aside for the moment the question of who “the people” are.

Is representative democracy really in crisis? Representative democracy is a very complex construction of modern democracy, and it is this complexity, specifically, which seems to overwhelm people. What is representative democracy about? It is about distancing people from their own egoistic interests by collecting those interests into a pool of different interests. Its representatives must come to terms with these differences by hammering out compromises – particularly if nobody has the absolute majority – by establishing forms of cooperation, by finding solutions in which every part of society receives something. Do not forget: politics is about who gets what, when, and how. In democracy, you have to find solutions for the largest possible majority of citizens.

The system has different formats but, by and large, it is a system of checks and balances. This may provoke the anger of people who do not get their demands fulfilled in the first place. In a system of checks and balances, you may arrive at one decision, but you may also arrive at a countervailing decision. This seems to frustrate people. Brexit is the handiest example we have. In 2019, the government faced a legal challenge at the Supreme Court

on its handling of Brexit. The Daily Mail labelled the judges who ruled against the government “Enemies of the People”, as if they, and those who went before the court, did not have any right to do what they did. Of course they had that right. It is a bundle of very tricky issues.

You asked about the historical conditions in which direct democracy might thrive – or not. The most successful example is the much-quoted Switzerland. Even Switzerland did not arrive at a perfect form of direct democracy in one day. The development of the current system has a long history, and it was a reiterated, highly experimental process. However, its functioning might relate – and here more research is needed – to the question of centralisation and decentralisation. Switzerland is a decentralised country; I am not sure whether this fosters or impedes direct democracy. What is obvious is that the Swiss live well. However, their system is a highly formalised process in which we have also witnessed the emergence of very responsible citizens, citizens who care about what is at stake and who make informed choices. They come closest to the ideal representatives of what Montesquieu called *le citoyen vertueux*, which means that

you need to be responsible for what you do. That is not to say that the decisions are ideal. Whether decisions are ideal depends on evaluative perspectives. However, this concept of the citizen is something I rarely see in other countries with direct democracy. I shall say nothing about Austria and cede the floor.

GABRIEL BIANCHI

I am seated on the right “wing” but, from your perspective, I’m on the left. This is very typical of the confusion in the political scene and of how citizens perceive democracy – that was a joke. But distortion has to be expected in every mirroring and reflection of political opinion. Be it intentional manipulation or unintentional, caused by contextual noise.

I would like to speak about four concepts. One is the referendum; one is deliberative democracy; one is intimate citizenship; and one is new tribalism. Why intimate citizenship? To answer that, I come to my own background. My research ranges from sexuality, sexual health, and intimacy all the way to intimate citizenship and politics. I also have comprehensive experience with citi-

zens’ participation processes, like the EU-initiated “citizens’ consultations” that took place about ten or fifteen years ago in the newly acceded EU countries to foster identification with European Union citizenship. These were examples of what is called “deliberative democracy”.

Let’s start with the concept of the referendum. Andrzej, you asked about the reasons for the urge to get more direct democracy. There are two. The first reason is that a referendum is cheap. The Brexit example is indeed often discussed because it’s sexy, it’s cheap – politically cheap, not financially cheap – and it’s fast. It provides something like instant gratification in the political arena. That is why political manipulators reach for the referendum. Other direct democracy initiatives are not top-down, but bottom-up, and come from the citizens. One reason for these new initiatives for direct input into politics lies in what Michel Maffesoli describes as neo-tribalism: the structural change in society where the horizontal structure of upper class, middle class, lower middle class, and lower class – that is, the importance of stratification – is fading. New tribes emerge vertically. People fed up with individualist, modernist history seek protection in

the new tribes. They identify within groups, which gain yet more space in public discourse. These are not just tribes of people who like fishing or people who prefer cycling. We had a significant case in Slovakia involving opponents of vaccinating young children. These people were strongly unified within the new tribe of anti-vax. They sought to gain influence over political decisions about vaccination.

So, if the reason for top-down promotion of direct democracy methods is that it is politically cheap, the bottom-up initiatives frequently emerge with new societal structures, the vertical groupings of new tribes who – in the political arena – request and demand acceptance of their requirements, which emerge out of their new identity.

ANDRZEJ RYCHARD

Several interesting issues raised by our panellists. Firstly, there is the fundamental issue of to what extent direct democracy solves the crisis of representative democracy, or to what extent it is part of the problem, created via manipulation by political leaders. The political leaders who are

responsible for the crisis of representative democracy are the same ones who call for direct democracy. We have to react to that. But first of all, is the crisis really one of representative democracy per se, or is it one of increasing complexity, to which direct democracy might pose an oversimplified alternative by reducing that complexity? Could it work or not? To what extent is direct democracy an alternative to representative democracy, and to what extent might the two systems complement each other? To what extent are political parties responsible for the crisis of representative democracy? I would now like to hear reactions and contributions from the audience.

AUDIENCE SPEAKER 1

I am from the Polish Academy of Sciences, Scientific Centre in Vienna. I would like to start with the issue of complexity. The world is becoming increasingly complex, and the current crisis is one emanation of this. There are certain limits to direct democracy, basically because you only have the options of “yes” and “no”, whereas representative democracy, as has been pointed out, is about bargaining

and compromise. You won’t arrive at a zero/one decision, a black-or-white decision. It gets even worse. Often, in direct democracy, it is not even “yes” or “no”. Very often it is simply “no”. I will give you an example based on my own experience. A few years ago, Krakow applied to host the Winter Olympics, and I served as a pro bono attorney to stop this. We went to court, and then there was a referendum. The citizens said no and the idea was abandoned. In the same referendum there were three more questions. One of them was whether we want to have a subway in Krakow. One was negative, one was positive. The negative was easy to implement: it was simply stopped. The positive one meant that nothing changed, and that was about five years ago.

An even better example is Brexit. People were asked whether they wanted to leave the European Union. Many said that they would like to leave. It was never worked out what being outside the EU meant. A wide array of different statuses was possible. In the referendum, just the one straightforward question was asked: whether or not to leave. But who are you after you leave? There are at least five ways of being outside. It is not even possible to ask the right ques-

tions in a referendum. Even if you tried, it would be very complex. It would start with the description of the five options: the Swiss model, the Norway model, and so on. It simply does not work.

Then, the issue of decentralisation and democracy. I am glad that you mentioned the Polish decentralisation initiative. I am a founding member of the association behind this movement, and it is a hot topic in Poland. Decentralisation is a lubricant for the spreading of direct democracy. Direct democracy could well be a Trojan horse for decentralisation. If direct democracy is a simple yes or no question, then you have the majority prevailing, full stop. We, however, live in diversified societies. If we want to experiment with direct democracy, the only way to move forward is to tie it to decentralisation. In smaller communities there are different sets of questions. And then we can also start with regulatory innovation. We are still thinking along old-fashioned lines. Today's technology does not just mean that every voter could vote via smartphone. One idea to achieve a compromise between direct democracy and the typical representative democracy would be – and this was our proposal

in this particular project – to imagine a local parliament, a regional parliament. We often think of parliament as an assembly where people come together and waste time. Not that we are wasting time, but you know what parliaments look like today. Now think of a situation where mayors of different communities or towns who are ex-officio members of this parliament simply vote without leaving the office, just by inserting a token. So we are charting a middle course. We bring the vote closer to the people, but not directed to the people. Representatives who are close to them vote on their behalf. We are living in the time of Facebook and social media. The feeling was that social media would boost debate, but this feeling turned out to be wrong: we ended up with the opposite situation.

GABRIEL BIANCHI

I would disagree with your statement that you cannot solve complex issues in a referendum. In a bad referendum, you could not. In the Brexit situation, you cannot. But Brexit was not a referendum. Brexit was a political game. Last year, I had the opportunity to speak with

Andreas Gross, the “guru” of the Swiss model of the referendum. He explained that in Switzerland, according to the law, eighteen months must pass from the day when the referendum is called to the day the voting takes place. The government is obliged to publish a booklet listing all the alternatives, to help the people start a public discourse. Two people queuing for potatoes might chat about politics. This process takes one-and-a-half years. In this way, very complex issues can be decided. We need to distinguish between a “real” referendum and something that is just a cheap, sexy, and fast instrument abused by some politicians and governments.

ANNA KENDE

Part of the problem is that precisely those political leaders who advocate the erosion of representative democracy and traditional political institutions benefit most from traditional political institutions. Paradoxically, they mobilise their followers in a way that suggests we no longer need these political institutions. Exploiting this, they benefit from the current versions of democratic institutions. Part

of the problem is that the term “direct democracy”, as it is used in current political discourse, does not really reflect the reality of direct democracy. It is just a tool for those politicians who will benefit most from its use.

Another specific aspect concerns the region of former communist countries. The importance of responsible citizens has been mentioned. One aspect that brings right-wing and left-wing people together in a given region is the feeling that they need to be taken care of by a powerful authority. This is not specific to one political ideology. It is very common. Even though we have a special version of conservatism and of right-wing ideologies, that specific feeling that we need to be taken care of is deeply rooted in both the right and the left on a regional basis. So direct democracy does not function the way it could if not for this sense of waiting for the State to solve problems.

SONJA PUNTSCHER RIEKMANN

Thank you, Gabriel, for highlighting the intricacies of the Swiss model. I will be brief. One problem we need to address, at least theoretically, before we implement direct democracy

politically is the question of how, why, and by whom a referendum is called. Another aspect that cannot be overestimated is who reflects on, and bears responsibility for, the consequences. In the Swiss case, you have different scenarios of consequences that might emerge. I wonder whether, to stop political parties becoming very dominant in this setting, we might consider developing a constitutional basis preventing parties from holding referendums. In Austria, we have several kinds of direct democratic tool. One is a legally binding referendum to legitimate a fundamental change to the constitution. It is rarely used. The last time was when we entered the European Union. We also have the tool of legally non-binding demands, to translate the word *Volksbegehren*, presented by the people to the political establishment. Its history is interesting. Sometimes there is a high turnout with many people endorsing a referendum, only for it to disappear into the political players’ bottom drawers. So that instrument is rarely applied, and rarely successful. This, too, reflects the power of parties to manipulate political issues.

AUDIENCE SPEAKER 2

I was wondering how direct democracy is brought about by the social media and mass media. Many of the referendums we see in Austria now come via websites, and that is not very direct. It is mediated democracy, to some extent. Could you comment on that?

TOMÁŠ KOSTELECKÝ

One of the main disadvantages of direct democracy – leaving aside the ideal, very sophisticated Swiss type of referendum – is that it is often mediated. The desire for direct democracy is driven by people’s need to be heard. Most people are in favour of direct democracy tools because they feel they are not heard, not respected. The referendum might give them a false sense of being respected, but they may be manipulated via the referendum as well. This could be very dangerous.

ANDRZEJ RYCHARD

You have raised the important point that part of the population believes

there is a crisis of representative democracy. Direct democracy may serve, not as a real institutional mechanism, but rather as an ideological mechanism of legitimising what are sometimes fake, false, or superficial attempts to maintain power or change power structures. This is an interesting perspective, particularly for social scientists. I will call on Simona and then Gabriel.

SIMONA KUSTEC

In general terms, democracy is a construction made up of the institutions, and the rules of the game that they play both amongst themselves and towards the public. We know their jurisdictions and responsibilities; we know to whom they are accountable. This goes beyond political institutions. In democracy, we also know who plays the game when it comes to civil society, even on an individual level: who is here, with what kinds of responsibilities, with what kinds of interests and reasons. The very important question you emphasised is: who are the social media, in this democratic story? Do we know who they are? They are hidden, but they are one of the forerunners of direct democracy;

the modes and tools of their work enable this. And they do this work in an often very populist manner. They apply modes that are very dangerous to democracy: constant unverified stories which, as a rule, proves to be non-existent or manipulated. Nobody has taken the responsibility of paying for damage inflicted in public. There is also a pattern where you find political parties, even some non-governmental organisations, in the backstage of social media. So we do not know who a given social media account really is, who and what type of interests operate it; or how all of this might be related to the idea of direct democracy. All this non-transparency can be very dangerous, especially if you want to deploy it as a mode of conduct in promoting direct democracy. Which players, in direct democracy, are officially responsible for anything? And so who will take responsibility if something goes wrong? Who is taking that responsibility now in Great Britain, in the case of Brexit? Not one of those who set the whole process into action. Who is there for whom? We are living in complex times, from whatever perspective you look at it; and, yes, we have arrived at a kind of a democratic crossroads. The road that leads to-

wards direct democracy, as described by the existing patterns outlined here, is not the wisest choice.

ANDRZEJ RYCHARD

Complexity brings uncertainty, and people usually tend to minimise uncertainty. From that perspective, calling for direct democracy might just be one more psychological mechanism to reduce this uncertainty. Sometimes the call for transparency might itself obscure transparency. It might be a false front behind which unknown motives are hidden. This is very interesting to social scientists. Gabriel?

GABRIEL BIANCHI

I would now like to open up the concept of intimate citizenship. This was named by Ken Plummer, who also writes about the vertical groupings I mentioned, although Plummer is guided by slightly different ideas as compared to Michel Maffesoli's "new tribes" approach. Plummer talks about people's emerging needs in the area of intimacy concerning the body, gender, ethnicity, and language.

These “subcultures”, or groups of people, are asking to be heard. They are asking for space in the public arena, in the media, in industry, schools, education, science, wherever. But the public arena has limited space for the huge diversity of bodies, identities, genders, ethnicities, and languages. So we are overcrowded with group interests that traditionally used to be hidden. Now the public agendas are emerging, and the space, while it is not shrinking, remains limited. That is one reason for many emerging conflicts in the public arena. Ken Plummer states that we need to find ways to regulate the intimate needs of very diverse groups of people in the public arena. This is a new sort of conflict, and it puts on the table the private needs of groups that allegedly “did not exist”, say, twenty years ago. The needs are multiplying, but there is limited space.

To return to the referendum, I admire the Swiss model. Andreas Gross states that the idea of the referendum is not so much about the vote, but rather about the deliberative process that takes place in the eighteen months between the call and the vote. The outcome does not matter all that much. The most positive outcome is that, at the moment of the vote, even

those who lost have gained knowledge about the general problem and are able to understand the reasons why they lost. Which means that they may be cooperative even in a situation where they are not the winners. Again, a referendum, if run properly, is a deliberative instrument of democracy.

ANDRZEJ RYCHARD

We have discovered how complex the issue is. The successes or failures of direct democracy are contingent on various conditions. My impression is that we have heard more critical views than positive and optimistic ones. My general question to the audience is: what can we say about the conditions under which direct democracy might operate successfully? What is necessary for it to become an effective instrument of democracy?

AUDIENCE SPEAKER 3

I represent the Polish Academy of Sciences here in Vienna. We have a positive example in Poland, the *budżet obywatelski*, which translates to “citizen budget”. In our cities, cit-

izens can decide which part of this budget is allocated to which project. For example, we have an empty parking lot. What will we do with it? Do we build a park, a kindergarten, or something else?

ANDRZEJ RYCHARD

True, that is a very concrete example and in many localities in Poland, it works well. But it does not solve the problem of the federal government.

AUDIENCE SPEAKER 3

Of course. I was wondering whether part of the problem is the size of the group. I am not an expert, but the smaller the group, the better it seems to work.

ANDRZEJ RYCHARD

The issue of group size almost always emerges in debates about direct democracy. Are there any necessary or unavoidable relationships between group size and the success or failure of direct democracy? Should we keep the community small? Would it work in a bigger one? Tomáš, please.

TOMÁŠ KOSTELECKÝ

There is a relation, but probably not a causal or deterministic one. The example of Switzerland shows that it is possible successfully to carry out large-scale referendums. In the Czech case, we have the long-term experience that small is beautiful. We have representative democracy structures in the smallest municipalities and local governments. The people's trust in these governments is very high. These are the only politicians who can maintain their trust on a long-term time scale. The small community size helps because there is no need for mediators, and citizens can have a direct relationship with their representatives. An environment where you can ask your mayor about your concerns over a beer in the corner pub is conducive for direct democracy to work. In larger communities, a mediator is necessary, you need organisation and structures, and things get more complicated.

AUDIENCE SPEAKER 4

My name is Christina Lutter. I am from the University of Vienna and the Austrian Academy of Sciences. I am a

historian and therefore not an expert. A question occurred to me while listening to the contributions from the audience and Gabriel Bianchi. If we were to take the example of Swiss direct democracy and combine it with the number of participants acting via social media, what could we learn from that? To put it more simply – and this is a question out of curiosity – how do Swiss people react to direct democracy in social media? How do they debate on this larger level, and how does that compare to the traditional medium in which they used to discuss those issues?

GABRIEL BIANCHI

I do not know what happens in Switzerland with social media, but I think we can count on the multichannel nature of communication. So, I believe, all the crap on social media is not the only communication that happens there. If there is a sufficiently long time period for communication to take place, I would presume that the social media would soon tire of it because these are frequently fuelled by emotion, with aggressivity and low-value content. It is more about different forms of communication.

People can have discussions in the workplace, in bed, in public transport, when queuing for potatoes, wherever. All you need is enough time for the process to happen.

AUDIENCE SPEAKER 2

I do not want to monopolise this topic, but I want to follow up on what Christina Lutter said and the panelist's response. Fifteen percent of all social media accounts are bots. That is an empirical result. Bots are programs written by somebody who wants to pretend there is a real person behind the activity. This poses a major threat to all kinds of deliberative processes on social media. One prerequisite of a mediated direct democracy would be to find ways to exclude bots from social media; and it's not easy to do that. I would also like to take up what Gabriel said about responsibility. I would rephrase it as "accountability". Social media users need to be made accountable for how they participate in discussions that could be called deliberative processes.

AUDIENCE SPEAKER 5

I am from the Slovak Academy of Sciences and not an expert. When talking about direct democracy in Switzerland, we wonder whether there are other communities or countries which might follow its example. Are there any general indicators of processes in a society which indicate its readiness to move towards direct democracy?

GABRIEL BIANCHI

I support a combination of representative and direct democracy elements. Many effective applications of direct democracy are suitable for improving representative democracy. I believe in the general applicability of referendums. The main reason these have failed in Slovenia and in Slovakia was anxious distrust of the citizenry on the part of politicians. Having a 50% quorum in countries with traditionally low participation in elections is like making a mockery of the instrument of the referendum. Introducing a working referendum model requires a lot of political motivation, courage, as well as “educating” the citizens – and this would

mean having no quorum. If only one citizen shows up to the referendum, then the referendum will be decided by this one, single vote. This extreme example can be useful for building the citizens’ awareness of their power and responsibility.

SONJA PUNTSCHER RIEKMANN

My position is similar. Direct democracy instruments should be implemented as complementary to representative democracy, and with very clear conditions and regulations. Gabriel has already said everything that needs to be said in this respect. I now come back to the issue of social media. Firstly, lies and manipulations in politics are as old as mankind. They are not a privilege of the new social media. Returning to Brexit, the biggest liars were the tabloid editors. I would not overestimate the “evilness” of the social media. Nonetheless, they are a new source of problems. So how to regulate this? We simply need to take the problem seriously and let politics come up with the regulations. I would like to remark on the dichotomy that has been verbalised in our debate: Should direct democracy be applied

to low politics or high politics, to use a term from political science? Should it be used on a local level, on a national level, or even on the European level? Incidentally, we did not touch upon Europe in our debate. You need a good mix, for the simple reason that high politics also presents questions where people should be given direct influence. Most countries had referendums on the question of EU membership, because this changes the entire context for a given country. Why should people affected by that not have a say on it? At the beginning of the 1990s, the French political scientist and economist Jean-Marie Guéhenno wrote a book about the end of democracy. One of his most savvy contributions was that we will all end up like the citizens at the time of Emperor Caracalla. We will all be declared citizens, but we won’t have any influence in the process of decision-making. If we reduce citizens to deciding whether parks should be maintained or not, or whether the benches there will be painted green or brown, will they really feel like valuable political actors? The two aspects need to be balanced. I come to my final point. Winners and losers are part and parcel of this process. Returning to what Gabriel said about

Switzerland, we need to give the losers the feeling that they have lost for good reasons; that they can live with the outcome; that they understand why the decision was made and how it came about. And that they might have a second chance in a second round. Perhaps not tomorrow, perhaps in a couple of years; but that it is an open and dynamic process.

ANNA KENDE

I would like to return to group size, the size of the community in which a referendum can work in its ideal form. This is a key question, and we have empirical answers. The main issue is whether the actors place the community's interest above their own short-term political gain. Two sides having different ideas about the future of the community is not a core problem. The question is whether the political actors have the interest of the community at heart. It is not accidental that referendums work better in smaller communities, because people tend to place the community interest above their own. They are much more willing to make sacrifices for the community when that community is a small group. There

are, however, mechanisms to keep citizens obligated, to keep them committed to larger communities. There are various ways to achieve this. One is through laws and regulations. Another way of creating committed citizens is to identify with the groups, to place importance on the groups' central needs. Size matters, and this brings us to one of most important questions for humanity today: whether we are able to make sacrifices for the greater interest of our community – a community that is no longer a small, delineated community, but embraces all of humanity. I would like to add that emotion is not necessarily a bad thing. We would not be able to achieve much without emotion. Social media should not be held accountable for human emotion as a source of the problem. Aside from fake news and bots, both of which are definitely problems that come with social media, the simple fact that we spend a lot of time with like-minded people, discussing politics with people who share our views, is not necessarily a bad thing. It turns out that when we defend our views against people who disagree, we tend to become much more radical than when we discuss the same matters with people with similar

views. This seems to contradict some of our earlier ideas about the problems of social media. Social media can raise our awareness of different arguments and help us reformulate our opinions.

SIMONA KUSTEC

The future is in the hands of democracy – the refreshed mode of representative democracy. We still need an intermediary working for politics in the name of the citizens. These intermediaries may still be political parties, but very different ones from what we have today. Political parties as a kind of human service structure, working equally and equitably for everybody. They will need to address intergenerational justice and the environment, and practice empathy. They should be sensitive to the human world in which and for which they are active, and for which we need democracy. Direct democracy in this world should be applied whenever decisive questions affecting all of our future are on the agenda.

TOMÁŠ KOSTELECKÝ

The best model is a combination of representative democracy with elements of direct democracy. Direct democracy can be useful: for example, in raising issues politicians are not actively pursuing. A referendum might also take the form of veto rights, enabling citizens to stop political actions. I do not support the instrument of a binding direct democracy for all political decision-making.

CONCLUSION ANDRZEJ RYCHARD

I would like to thank our panellists for their inspiring contributions. I would like to thank to the audience who acted as a collective panellist. So we had the experience of direct democracy in action. If you ask me for conclusions, I can tell you that we have come to an inspiring disagreement.

In this discussion, direct democracy was approached from various perspectives. We addressed the reasons for the increasing popularity of the concept and its potential consequences. The panellists analysed direct democracy in the broader context of its

relationship with other phenomena such as populism and decentralisation, and the necessary preconditions for direct democracy.

Many critical voices addressed the issue in view of recent populist tendencies: to what extent direct democracy is a response to the problem of populism, and to what extent it is part of the problem. The same leaders who are responsible for the crisis of representative democracy are now demanding direct democracy. Often, social-media-based direct democracy is promoted by these same media.

The obvious question arises of to what extent that 'direct democracy' actually serves the purpose of the original practice, and to what extent it is just mediated by social media presenting false solutions. Instead of functioning as an institutional mechanism for solving problems, the idea of direct democracy often serves as a mechanism to legitimise existing power structures and resistance to change. Instead of facilitating transparency, it allows actors to hide their identities and actual motivations behind the front of direct democracy.

To balance this picture, several participants from both the panel and the audience illustrated how direct democracy mechanisms can be val-

uable and efficient. The success or failure of direct democracy is contingent on various conditions, including community size and historical tradition. Attempts to introduce direct democracy in countries historically unprepared for it often turn out to be problematic. However, we are not the slaves of our past. We have the potential to overcome the path-dependency of our histories. Introducing mechanisms of direct democracy will, under certain conditions, contribute to mitigating inequality and supporting socio-political liberties in a given society. More empirically based research in the social sciences is necessary to determine all these conditions and develop suitable concepts.

ANDRZEJ RYCHARD, Head of the Institute of Philosophy and Sociology of the Polish Academy of Sciences, is a sociologist within the field of political and economic sociology.

TOMÁŠ KOSTELECKÝ, Director of the Institute of Sociology of the Czech Academy of Sciences. His key professional interest is the analysis of spatial aspects of human behaviour, socio-spatial inequalities, local and regional governance, and the process of (non)convergence between the “old” and “new” Europe.

ANNA KENDE, Associate Professor of Psychology at Eötvös Loránd University, Budapest, is a social psychologist with a research interest in intergroup relations, prejudice, political movements and intergroup solidarity. She has led a number of international research projects on the issue of discrimination, particularly about discrimination against Roma people in Europe.

GABRIEL BIANCHI, Deputy Director of the Institute for Research in Social Communication, Slovak Academy of Sciences, is a social psychologist focusing on diverse forms of human subjectivity, conducting non-medical research in sexuality, reproduction, parenthood, family and intimacy, as well as in values, identity and deliberative democracy.

SONJA PUNTSCHER RIEKMANN, Salzburg Center for European Union Studies, is Professor of Political theory and European politics at the Austrian Academy of Sciences.

SIMONA KUSTEC is Deputy Chair of the Slovenian Academy of Sciences and Professor at the Faculty of Social Sciences of the University of Ljubljana.

PANEL 6

YOUNG SCIENCE

Chair:

Michael Drmota, OeAW

Panellists:

Nicole Dołowy-Rybińska, PAN

Hana Sychrová, CAS

Marina Klemenčič, SASA

Benő Csapó, HAS

Martin Venhart, SAS

MICHAEL DRMOTA

What, how and why should we teach our children? The different aspects of these questions include not only science, but also political and social issues; for example, concerning children with disadvantaged backgrounds from poor regions. How should academia support young people, children, and students?

BENŐ CSAPÓ

I propose that we approach this problem from the perspective of scientific research; but, first of all, that we look at it from a child's-eye perspective. From this viewpoint, we might identify a number of relevant questions that might also be answered through scientific research. How can science education contribute to the cognitive development of children? How can the developing brain, the developing mind be stimulated by means of scientific education? We need to show children how science education is useful for them; how they can apply the results of science to their everyday lives. We need to develop fun activities, taking their environment into consideration. We have to study the

early development of problem-solving and creativity and their component skills. And we have to stimulate these components with playful activities. We should also think about the non-cognitive aspects of development – curiosity, interest, motivation. Since one main source of motivation is success, we should find ways to facilitate that sense of achievement through successful learning.

NICOLE DOŁOWY-RYBIŃSKA

The question of what academia can do for children and teenagers is also the question of why academia should get involved. Without conscious citizens, without people who are able to distinguish what is based on facts from what is fake news, how people are manipulated and using what instruments, we cannot create a conscious society; but we also cannot raise future researchers. So academia is important and should get involved. The “how” is the challenge. The Polish Academy of Sciences has launched a number of activities. BioCEN, the Academy's Centre for Innovative Bioscience Education, was created specifically for science outreach. Outreach activities can cut

severely into scientists' already tight time budget. In part to address this problem, ten years ago, BioCEN was created as part of the Polish Academy of Sciences. Devoted to promoting science, it has also become a platform for exchange between scientists. Children are invited to conduct hands-on science experiments. Science education activities for teachers help enhance children's science training in schools. In Polish schools, the level of science education leaves room for improvement. Many schools do not have laboratories. The infrastructure to facilitate children's experience of experimental science is lacking. BioCEN provides a space not only for presenting research results to the public but, more importantly, for gaining rewarding, pleasurable hands-on experience of how science works.

The Young Academy of the Polish Academy of Sciences consists of 15 to 30 researchers, which is not a particularly large group. We host between fifteen and twenty outreach events every year. We meet with children, teenagers, interested adults. We show them our experiments and involve them in discussions on a wide range of topics such as democracy, consciousness, fake news, and

other issues from our disciplines. Our members equally represent the full range of disciplines at the Polish Academy of Sciences.

Another successful activity is a one-day workshop for girls and young women who are nearing the end of their high-school years or starting out on their university studies. Many young women interested in a science career are troubled by doubts and uncertainties. So a group of successful young women researchers present their research, but also acquaint workshop participants with their daily working life, with all its problems and challenges, rewards, and successes. They share their own passion for science, which often sparks curiosity and fascination in their young audience. They also address the continuing problem of discrimination against women in academia and provide strategies and methods to deal with it. The workshop provides strong encouragement for interested girls to go into careers in the natural sciences.

HANA SYCHROVÁ

I would like to return to the first speaker. Our academy has also decid-

ed that it is important to start the education process with small children, to awaken their curiosity, to talk to them, to show them how things work, to help them understand the causes and effects. So this is what we do.

Our academy also organises summer camps – not for the kids, but for their teachers. The participants teach at elementary schools and high schools. The focus alternates every year, so one year the program might be focused on biology and chemistry teachers, and the next year's program might be directed at teachers of mathematics and physics. We educate participants about new education methods, but also about the latest scientific results. In our country, teachers graduate from university with a pedagogy degree, but they often lack time and opportunities to follow the latest developments in science. Modern media form part of the activity; for example, with a series of short videos on “non-distorted science”. In those videos our – mostly young – researchers illustrate phenomena in nature, in society, in history. Since we started the series two years ago, we have reached more than 4.5 million views.

Our program for high school students, Open Science, usually starts

at the beginning of the school year in autumn. Students apply online for an internship in a research laboratory. In the course of the school year, they spend one or two days per month on their own scientific project. At the end of the school year, the teenage participants present their scientific results at a special conference. The program is very popular. We provide about 100 topics for the kids to choose from, and we typically receive between 900 and 1,100 applications for these 100 internship placements.

MARINA KLEMENČIČ

I will be brief. What do we mean when we talk about science? Many examples from the natural sciences have been mentioned, but let us not forget the social sciences. When we say we need to teach children how to think scientifically, what do we mean by that? What we should teach children is how to observe, how to compare, how to draw conclusions, how to plan, how to evaluate and then how to recapitulate the information. We should give them the ability to think about any topic, independent of its research domain, by creating a scientific process in their heads. Our

future researchers need to be able to think things through. Researchers should not just blindly reproduce the science, but should be able to arrive at critical assessments.

MARTIN VENHART

To conclude this first round, I would like to start with my own experience. When I returned to Slovakia eight years ago after a postdoc term in Belgium, the situation at the Department of Nuclear Physics was chaotic. I am aware that nuclear physics is not very popular here, but Slovakia is a very pro-nuclear country with a high demand for excellent nuclear physics research. So, in the department, nearly all the members were retired or close to retirement. Faced with the challenge of building a new group from scratch, I recruited students from all levels, from high-school students to PhD candidates. Now, after eight years, the average age of the group members is thirty-eight. Only one person is retired, and that person we want to keep.

One of the high-school students studied at the school of technical engineering. He designed the electronic system that protects the germanium

detectors at CERN against damage by overheating. It already paid off; it saved one detector. So, at the age of seventeen, that high-school student became co-author of a research paper based on CERN data. So I started recruiting students at a very early stage. This year, the first PhD student graduated who had been working with us since the start of his university career. This strategy has turned out to be very successful. Recently, the Slovakian Academy of Sciences started a program to improve on this. Young researchers or even PhD students from the Academy visit high schools to teach one regular lesson on a topic requested by the school.

Two years ago I was in Kyoto at the Science and Technology for Society forum, a very high-level scientific policy conference. I was involved in the Future Leaders section. We had the opportunity to discuss any topic of our choice with a Nobel laureate. This inspired me to organise something similar for our students. So we invited renowned Slovakian researchers to meet with students who had been successful in international competitions. They had a great time.

MICHAEL DRMOTA

I should add a little about Austria. I am a mathematician, which is not a very attractive field for high school students. It is not easy to convince them that mathematics can be fun and addictive, and that it is important for science and progress. The results of the PISA studies show that, while Austria is not performing badly, neither is it performing well. There is much room for improvement, and there are many initiatives to support science in schools. One university activity that starts every July is the *Kinderuniversität* or “children’s university”, where young school students take classes at the university and even get a special children’s degree. Then there’s the general initiative of *Töchertag* or “daughters’ day”, where young daughters can join their parents in their workplace. The universities usually design a fun program for these 10 to 14-year-old girls. Private initiatives are also numerous and often of high quality. A little society called Young Science allows university-level scientists to register to teach school classes. The society matches the requests from schools to those scientist volunteers.

A year and a half ago, I was involved in the university initiative *Forum Mathematik*, TUForMath. Its purpose is twofold. Firstly, we conduct public science outreach lectures on mathematics and related subjects. Lectures take place every second weekend, with more than 100 participants at each event. Secondly, and this is related to our topic today, we offer mathematics workshops for school classes. Children aged 10 to 14 can participate. We have four workshops, and we offer 8 to 10 sessions per week. So every week, up to 120 children attend workshops about new and exciting topics in mathematics that are not part of the school curriculum. Our workshop leaders are teaching assistants and students from our faculty. We have observed that there is considerable need for such initiatives. We have been getting a lot of positive feedback.

I would like to come back to the different dimensions of this issue in our discussion. There is the political aspect, the curricula, the legal foundation. Changes in policy should be driven by science, which is not always the case.

BENŐ CSAPÓ

I would like to reflect on some of your comments. Firstly, science outreach is important, especially for the older generation of students. For teenagers, orientation by way of role models is very important. It enables them to envisage science as a realistic career option. In Hungary, we offer a “Researchers’ Night” event one evening every September. On this night, laboratories are open to the public. I come from the university city of Szeged, which has a population of about 160,000. On these nights, the entire city is mobilised for this event. Groups of schoolchildren led by teachers or parents fill the streets. In the laboratories, we show the kids how science works. We present interesting and attractive experiments.

In Hungary, the entire month of November is dedicated to science. Public talks by leading scientists and other science events take place every night at the Budapest headquarters of the Academy. Universities organise similar programs in their cities. We focus on how science contributes to the progress of our country. If you are familiar with the conflict between the Academy and the government

last year, you may appreciate how important it is to show the citizens that the taxpayers’ money that goes into science is used effectively and produces results. Rather than a donation made to scientists, this money is an investment with a very high return. To create and maintain this awareness, we must show and explain these results again and again. Besides, it is important to familiarise young people with the idea that, as researchers, they will not just spend taxpayers’ money, but will contribute to progress and economic growth.

I also agree that we must expand the concept of science to encompass the social sciences, especially empirical social sciences, which are based on the step-by-step research methods of natural sciences: collecting data, analysing them, forming hypotheses, and working to prove them. So we should also motivate interested young people for a career in the social sciences. Most of today’s societal problems are related to social sciences – migration, climate change, sustainable development. This means that education, psychology, economics, and sociology, all belong to the hard core of today’s scientific research.

NICOLE DOŁOWY-RYBIŃSKA

An important point is that we need sustainable programs for educating young people. Schools have the role of teaching children – above all, teaching them critical thinking and passion for science. In Poland, not all schools fulfil this role. One core problem is the low budget for schools and education. The teacher-training system, which was mentioned already, is another. I agree that we, academia, need to make our voices heard within this political discourse. We need to show that educating future scientists is not just important for science, but for all of society.

Most of the different projects, activities and ideas that are put into action, as we have seen from the examples that have been mentioned, are based in the cities, where research institutions are primarily located. It is essential to take these initiatives beyond city limits into the rural areas. Rural teachers have a great need to learn new education tools for teaching science methods to children. We should enable them to participate in programs that are currently only or mainly available to teachers in urban areas. We have a problem of unequal access to new education tools and

initiatives, for children and teachers alike. Ideas and concepts for addressing this problem could be developed within the framework of academia. In the Young Polish Academy, we have started this process. The situation is challenging. The researchers involved live and work in ten or eleven different cities. Organising events in those cities is straightforward. Taking events into the territories outside these cities, less so. To achieve this, we need to build a network of cooperation with schools, individual teachers, societies, activists, and the like. In this process, another problem emerged. Over the last thirty years, the number of cultural centres in rural communities has decreased considerably from Communist times. This Polish problem might also exist in other countries of the region.

HANA SYCHROVÁ

How to include children from small towns and villages is a problem in the Czech Republic as well. This is one reason why we launched our videos and other social media initiatives. I am not sure whether the Czech situation regarding the social sciences and humanities is different from

other countries in the region. These fields are attractive to teenagers entering university. Many decide to study humanities or social sciences; a much larger number than go into technical sciences or mathematics or physics. However, as soon as they obtain their master's degree, they leave university. The experience of university researchers in sociology, history, or archaeology is that, out of the large number of intelligent and successful students, only a handful accept offers for PhD placements. Humanities students are much less interested in embarking on a research career than are their fellow students in mathematics, physics, and the technical sciences.

MARINA KLEMENČIČ

This is very interesting, because we do not see this trend in Slovenia. One possible cause might be the difference in the education system. Through the Slovenian young researchers' program, the State provides salaries for a large number of PhD students. Slovenia is – perhaps even internationally, but definitely EU-wide – the country with the most PhD students per capita. 4% of our population have a PhD. It's extraordinary. This

comes with its own problems. Now our young citizens have a PhD ... and cannot find a job. We do not have enough positions for our university graduates.

I recently got involved in a European project for teaching children scientific terminology via music. This interdisciplinary collaboration between our faculty of pedagogy, me as a biochemist, a group in Great Britain, a group in Cyprus, and a group in Croatia merges knowledge from different fields. I am in charge of communicating biochemistry concepts, and the music and pedagogy specialists will develop music and instrumental backgrounds to make children more susceptible to learn new concepts. This will be done in as many European languages as possible. Making such state-of-the-art science training available in the children's mother tongues will provide equality of access across urban and rural areas.

MARTIN VENHART

In Slovakia, we are facing the serious problem that our students and high school graduates are leaving the country. This problem exists

across all V4 countries but, at a rate of 30%, it is especially pronounced in Slovakia. The university with the largest number of Slovakian students is Brno in the Czech Republic. I mentioned the conference we organised for students who succeeded in international competitions. Out of these twenty-five of our very best students, not a single one stayed in Slovakia. It is unlikely that they will return. We are losing the young people with the greatest potential for science. We urgently need to address this.

MICHAEL DRMOTA

We have heard about many initiatives in each country. I would like to add an unusual one by the Austrian Academy of Sciences – a science comic competition. It took place this year and the winning comics were published almost immediately. Two weeks ago, they were honoured in a presentation at the Academy, and now you can access the comics online.

We have seen that there is great need for science education initiatives, and many exist to address this need. We have heard about ways in which academia can support the

education of our children, above all in science. We can educate teachers. We can advise on policy in support of informed, evidence-based decisions, counterbalancing political motivations. We can support schools through a range of programs. Academia is essential to this process.

Now, can we revise our research agenda to improve the situation further? Are there relevant research questions in pedagogy or educational studies? Can we develop the university curricula for teachers? What is your experience, and what is the policy in your respective countries?

MARTIN VENHART

I would like to share my experience with the CERN initiative Beamline for Schools. A dedicated beamline for different particles and with different particle detectors was constructed, and high-school students were invited to propose experiments based on the available equipment. The best proposals were awarded beam time at CERN and their authors got the opportunity to perform their experiments. When I looked at last year's proposals, I became aware of a significant problem. It was obvious that the

winning experiments were not developed based on high-school-level knowledge, which implies that their young creators had outside help. The other proposals I could believe were done by high-school students. So there is a certain risk of outside scientists interfering in these projects to the disadvantage of candidates.

BENŐ CSAPÓ

In most post-socialist countries there is a lack of education researchers, so education is, and educational reforms are, mostly still based on opinion. The Baltic countries are a good example, and Estonia in particular has been a pioneer in scientifically established interventions. Our Estonian colleagues started to increase their education research capacity about fifteen years ago. If you check the number of Estonian publications in Scopus in the field of education, you will find a rapid increase. This rise in the number of publications was soon followed by the improvement of education outcomes. In the beginning, they learned a great deal from the Finnish example. Since then, Estonia has advanced beyond the example of Finland and

now ranks higher in international assessment programs such as PISA. We learned from another panel today that they are even more successful in obtaining ERC research grants.

So there is a direct connection between good educational research and research-based improvement of the education system, which in turn affects economic growth and scientific productivity. About six years ago, László Lovász, just after the start of his mandate as president of the Hungarian Academy of Sciences, established the new Content Pedagogy research programme. The term “content pedagogy” translates into German as *Fachdidaktik*. It deals with the teaching of subject matter knowledge, for example in mathematics, physics, or chemistry, or in other subjects, including the social studies and humanities. One of the research groups sponsored by this program works on language education: the teaching of foreign languages and related topics. The budget of this program is about 600,000 Euros per year distributed across nineteen research groups – a modest amount. In the space of four years, these nineteen groups have significantly increased the productivity of Hungarian education research. This has turned

out to be one of the most successful research programs in the history of Hungarian educational sciences, and might also be taken as an example by other countries. A similar program is currently in preparation in the Baltic States and, I think, Lithuania will soon follow the Estonian example. We have also seen promising educational reforms in Poland. It can be proven that improving and increasing research capacity in education will result in impressive returns.

I would like to mention another good practice in the Hungarian Academy of Sciences: the Presidential Committee on Public Education. This board supports the work of academy presidents, giving them research-based advice and enabling them to comment on educational issues in the country from a professional viewpoint.

NICOLE DOŁOWY-RYBIŃSKA

I will comment on the relation between politics, science, and education in Poland. We, too, are facing the politicisation of science and education. Over the last two years, the Polish Academy of Sciences has issued a few important statements:

about the destruction of forests in the East of Poland due to political reasons; about what politicians refer to as “the ideology of gender”; about other interesting issues. Every single statement was ignored by politicians. 100%. In a situation like that, how can people trust us if our research-based reports remain unheeded? What is more, in the media, politicians claim that our explanations are not true, that they are nothing but “ideology”. In a world of new media and fake news, this is one of the reasons why it is so important to teach children and young people critical thinking. They need to be able to distinguish between what is based on facts and what has been created to serve overt or covert purposes. If we fail in this, this causes problems in raising not only future researchers, but also future citizens. The role of academia is very important in this respect. The environment for our interventions, however, has changed and presents many new challenges. It has become very difficult for scientists to enter public discourse and make themselves heard as credible experts. Academia and academics have lost their authority in social resonance. We need to work on rebuilding people’s trust in science.

AUDIENCE SPEAKER 1

A more general approach to this is “citizen science”. In these projects, ordinary citizens are involved in scientific undertakings, for example in the data-gathering process. In some projects, hikers can take photos of certain plants and upload them to a database which scientists then use for their research. Another research project requires 10,000 dogs for statistical analysis. In this way, non-scientists can contribute to tangible scientific results. This helps them understand science better and build a connection to it, but it also changes the scientific sphere in a similar way.

OLIVER JENS SCHMITT, AUDIENCE

Over the last two-and-a-half years, the Austrian government has actively encouraged the Austrian Academy of Sciences to become more involved, especially in young science. This might also be useful for the Polish case. Young science will deliver long term results. Citizen science is important, but its participants usually already have a certain affinity to science. It’s like preaching

to the converted. The target group of the comic project, for example, were children between eight and twelve years of age. The main goal was not to teach scientific content. Rather, it was to facilitate the experience that science can generate enthusiasm, interest, curiosity. We don’t use comics for instructional purposes, but to illustrate what science could be and what it is about. The presentation of the comics was organised so as to involve schoolchildren directly. We invited mostly school classes from the less privileged areas of Vienna and from rural areas. The reaction of both teachers and students was enthusiastic. While there, they heard about the Academy’s Space Research Institute, which fascinated our young visitors. Their teachers then asked to visit the institute with their classes – and we made this possible. Such experiences provide interesting lessons for us scientists as well. We need bring science to areas where science is not very present. We had about 300 schoolchildren. I am sure that around 90% of their parents had never heard a single word about the Academy of Sciences. We wanted them to take these comics and other goodies back home to their parents and tell them – and their friends and relatives –

about the fascinating space research centre they got to visit.

Like some of your countries, we also send scientists and academy members to schools. Many initiatives already exist in Austria, and the Academy simply joins in with these successful activities. Probably the most important program is what we call the “study foundation”. Modelled on the German *Studienstiftung*, it targets the most talented, active, and interested students nearing the end of high school or starting out on their university studies. As opposed to Germany, our approach is very inclusive.

The Austrian Academy of Sciences has the advantage that the Austrian President of Parliament is also the head of the Academy Senate. For a couple of years, he has been proposing research topics to the Academy in his capacity as President of Parliament. One part of these activities is a series of roundtables where one half of the participants are members of parliament and the other half are scientists. Dr Venhart can tell you more about that initiative. The idea is to inform politicians from all parties about science-related subjects, but also to exchange contact information to facilitate easy consultation. We very carefully brief the scientists

participating in these events to make sure their answers are short and informative. To produce results, the process needs to be sustainable.

HANA SYCHROVÁ

The Czech Academy of Sciences started such seminars at the Czech parliament, too, perhaps two or three years ago. We were asked by parliament deputies to hold seminars for them on hot topics like climate change or migration. Such events take place two or three times a year, and typically 3 to 5 deputies and about twenty journalists attend. Two or three speakers from the Academy explain the problem from a scientific point of view, in a very general way so that it is easy to understand. And usually, all the deputies disappear during the first half of the seminar. They want to be seen attending the media-effective event in the beginning, but in the end the researchers end up in discussions with the journalists. This has its own perks, as it will result in a number of media contributions. But unfortunately our deputies are not really interested in our advice, even though they propose the topics and ask us to prepare the seminars.

MARTIN VENHART

To be very brief – we have the very same experience in Slovakia.

AUDIENCE SPEAKER 2

I work for the Academy administration and am in charge of organising these parliament events. We do something that might seem radical and somewhat elitist, but it solves the problem you are addressing. We do not allow journalists in these meetings. We have four roundtables where only members of parliament and scientists may participate. The atmosphere changes significantly. Whenever the public is involved, professors tend to become very professorial, and members of parliament play to the public and want to come across as competent and knowledgeable. This changes radically when you give the two groups a comfortable private space where they can meet as human beings. An open dialogue becomes possible, where politicians don't hesitate to ask questions to which they do not know the answer. They get used to scientific thought, which is not an established part of the lived context of politicians. The ways

in which scientists tackle a problem are new to them. This is something worth learning for every age group, from schoolchildren to adults. So our experiences with this approach have been very positive.

HANA SYCHROVÁ

Our politicians, our deputies are the ones who prefer to have journalists present. If we suggest meeting without journalists, we are told that their goal is transparency. Society sees that we are discussing very important scientific issues. So they want journalists to be present, to show that they are interested.

AUDIENCE SPEAKER 2

We faced the same situation. Our politicians preferred journalists to be present. So we suggested bringing in the journalists later. First, we would give a presentation, discussing our findings. The politicians were interested, and now we are trying something new. We convene in the morning for confidential sessions. In the evening, we give a public lecture that covers the same topic from a very

general perspective. And there we have a media programme and invite the public. That is the next iteration of the format we developed. We respect the politicians' desire for public visibility. That's important. It's important for us, too. But if you mix intentions, you will not get a satisfying result. That is what we experienced, very much like you did.

MICHAEL DRMOTA

I have one more question. You mentioned sustainability. It is easy to create a single event, like the comics competition we organised. But it has to be sustainable in some sense. This is an omnipresent issue in education. You have to offer things again and again, or in variations, so they can lead to effective change. We need to enable sustained access to our activities – whether for children or for members of Parliament.

BENŐ CSAPÓ

I would first like to comment on the issue of critical thinking in the Internet age and the increasing problem of fake news. That is one of our re-

search fields. But when we attempted to define critical thinking, we immediately ran into problems. It is very difficult to identify precisely what critical thinking is. Scientific reasoning, on the other hand, is easy to define. Those aspects of critical thinking we consider particularly useful we found to be in considerable overlap with scientific reasoning, such as forming a hypothesis and then proving or refuting it. That is the core of critical thinking. You don't just have to believe statements, for example, in the news. You can find arguments for or against these statements. The problem is that if you are looking for information on the internet about issues that are not obvious – for example, alternative medicine – you will find ten times more false information than scientifically established facts. We have to teach children how to find accurate sources of scientific information. In this, academies have a responsibility. Our academy established a reliable website where you can find information about a number of crucial issues. We need to strengthen the reputation of scientific academies as the real sources of scientific information.

To improve sustainability, it would be important to establish stable re-

search funds for critical issues like science education. The European Union spent about 80 million euros in the context of the seventh framework programme for research on inquiry-based science education. Altogether twenty-two projects were supported in that programme – which was discontinued. Now, there is no dedicated resource for European researchers doing research on education, or on science education, or on critical issues related to education. This is a significant problem in Europe. In the United States and in some Eastern countries, there are dedicated funds for educational research, enabling researchers to react quickly to new issues and problems. In China and South Korea, major science institutions research and teach things like innovation and developing creativity. We have nothing like this in Europe.

Let me emphasise again the importance of developing students' reasoning skills, problem solving and creativity. Research results show that these skills are malleable. High-quality education contributes to improving them, and science education plays a prominent role in their developmental processes. In the 2012 PISA problem solving assessment

of fifteen-year-old students, Finland was the best performing European country and it still only reached tenth place. The first seven places were occupied by Asian countries, by those known for their innovativeness and rapid economic development (in the first three places were Singapore, Korea, and Japan). Ignoring the improvement of these essential skills may endanger Europe's scientific and economic competitiveness.

MARTIN VENHART

All the initiatives that have been mentioned are very important. I also participate in the Open Days. I show students how we work. It has just occurred to me that every child is born as a little experimentalist. When learning to walk, children try to stand up, take a first step, find their balance, and learn from their tumblers. It might be that we as parents, or perhaps as a society, impede and discourage this experimental behaviour. For example, we do not let them play with water because their clothes will get wet and they will spill water everywhere. So we give them toys that might not support the development of their critical thinking. One

example, at least for small kids, is Lego. Lego lets you build things that are not real. In the real world, you cannot build a tower like the one you construct with Lego. So, as a philosophical question, do you think this might be one area where the problem starts? Is it just my imagination? Rather than letting children play in nature and giving them the experience of climbing on – and falling out of – trees, we give them mobile phones and tablets.

MARINA KLEMENČIČ

The nature of creative thinking also does not align with the school system. In schools you are obliged to follow the system. But we must find a balance between the freedom that fosters critical thinking and creativity, and progressing the system as we know it today. Introducing more disciplines that enable children to explore on their own within the curriculum would be a good compromise between the two.

MARTIN VENHART

We should already start at elementary school. I have two kids, so I think I might be able to comment. You can let them experiment with some things, but you also have to consider certain limitations posed by real life. Once, a woman who attended several of my science-for-the-public lectures asked me to help her with a little problem. Her son, aged about nine or ten, was asking difficult questions she was unable to answer. So I made an agreement with him. I would not teach him directly but, if he arrived with a list of questions, I would try to answer them. My duty was to answer the questions and his duty was to prepare the questions. If he arrived without questions, we would not have a discussion. We started regular sessions. Sometimes I knew the answers, sometimes I did not, and then I had to do some research. His last question was whether I would come to his school. For that, I prepared a presentation entitled 'Why do we need science?' When I came in, the children were lying around in their classroom. I said two sentences and then I just waited and let everybody comment on my statement step-by-step. It was one of the best experiences I

ever had. I decided to not go to high schools anymore. I would just try to work with these kids.

AUDIENCE SPEAKER 2

This is a very good example of a very individual form of knowledge transfer between science and society, if you wish to separate the two. There are many ideas and possibilities for achieving this type of transfer from the scientific world to various levels of society, from primary schools to parliaments. The problem I see, besides financing all this, is the scientific reward we get – or do not get – for these activities. As a scientist, you need to work on publications. You need to obtain third-party funding. You need to present your findings at conferences. All that is hard currency in scientific careers. So if you spend a lot of time on these transfer activities – which are, in Austria, summed up in the third mission – this goes without reward worth mentioning. What is it like in other countries?

HANA SYCHROVÁ

In the Czech Republic, every five years we have an evaluation of all our research teams at the Academy. Evaluation not just at the institute level, but at the research-team level. On the one hand, we want our researchers involved in outreach activities. On the other hand, for this important evaluation – which has an enormous impact on their next five years of work – we are asking for scientific output, papers, conferences, number of postdocs, etcetera. We have international evaluation committees without any Czech members. So now, a major issue for the Academy Council is how far we should advise jury members not only to evaluate scientific results, but also to assess science outreach and other activities for the good of society. We are still working on ways to set a balance. How much of the scientific life of a researcher should be devoted to research and how much to outreach? The Academy Council has seventeen members, and there are seventeen different opinions on this.

NICOLE DOŁOWY-RYBIŃSKA

We have the same problem in Poland. Every four years, what we do and how will be evaluated. Outreach and other pro-society activities do not count. That is why I acknowledged the necessity of institutions devoted to popularising science and hands-on science outreach activities with children and teachers. The Bio Centre I mentioned, which operates within the framework of the Polish Academy of Sciences, is working well. We were surprised at just how effective it turned out to be. The everyday job of the centre's team is to work with children and teachers. Located in Warsaw, they also raise additional funds to go out into rural areas, with a science bus that travels around Poland. The team consists of five people working full time, and several volunteers: PhD and master's degree students who enjoy working with children. In such activities, it is important not to just play the role of the brainy scientist who can outperform the smartest people. Without the passion for transferring, not only knowledge, but also fascination for science, it would not work. Another thing that makes the Bio Centre so effective is that the team works closely with

the institutes. There is a constant exchange of ideas, potential topics, and people visiting them in their castle. Of course, the Polish Academy of Sciences devotes part of its budget to BioCEN. These are not extra funds allocated by the government. The Polish Academy of Sciences decided that this is important. There is only one centre, however, and it is for biology and life sciences. It would be good to have more centres like this within the framework of the Academy.

MICHAEL DRMOTA

Thank you all for your input, and for coming to Vienna to take part in this panel. The discussion has shown that the topic I proposed – perhaps not the first thing that springs into mind when thinking of academies – is an important issue. Dissemination should be part of scientists' work, and there should also be institutions devoted to science outreach. The best we can do, even though our scientific work leaves little time for it, is to invest in our future, in our children.

CONCLUSION

MICHAELA DRMOTA

The issue, as we understood it, is the scientific education of children and schoolchildren. The goal is to invest in the future, to stimulate curiosity and interest, and to develop critical thinking. The impact on society, economy, and also science could be enormous. Today's children will be tomorrow's citizens.

What is needed? Firstly, a good school system based on scientific evidence rather than opinion. Secondly, excellent education of teachers, not only at the university level, but also after university. Thirdly, support from academia and related groups.

We collected a vast number of existing initiatives from panellists' countries, such as open science, several categories of workshops, science-meets-school events, and others.

There are problems. As has been mentioned, one of these is the school system. Another is how to develop sustainable support mechanisms rather than individual interventions. It is easy to create a one-off initiative, but to create a long-term series or system is more difficult. There are other difficulties: for example, concerning children with underprivileged back-

grounds or from disadvantaged areas. The need for all these initiatives, from academia or non-academic institutions, is great.

It is also necessary to invest time in communicating with politicians to raise awareness within politics. There is a need for dissemination, for involvement in all these young science activities. This should be part of the everyday work of scientists, at least to some degree. The investment in our future is the most significant one we can make.

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