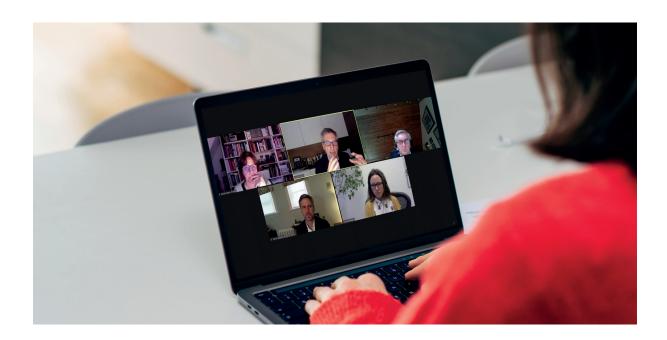ÖAW **AUSTRIAN ACADEMY OF SCIENCES**

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JOINT ACADEMY DAY 2021
ROYAL SOCIETY OF CANADA | AUSTRIAN ACADEMY OF SCIENCES

JOINT ACADEMY DAY 2021

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AUSTRIAN ACADEMY OF SCIENCES | OEAW

18th MARCH 2021 – AUSTRIAN ACADEMY OF SCIENCES

ÖAW

CONTENT

EDITORIAL

ANTON ZEILINGER

Our very first Joint Academy Day was held in 2018, together with the Royal Netherlands Academy of Arts and Sciences, followed by our collaboration with the five academies from the Czech Republic, Slovakia, Slovenia, Hungary and Poland in 2019. This year, we were very privileged to work with the Royal Society of Canada.

We had, of course, hoped to host the event here in Vienna. However, the pandemic dictated otherwise, and this year's Joint Academy Day was held entirely online. I am glad to say that this did not hinder our discussions at all as our Austro-Canadian alliance was already well established. The most important activity our two academies have in common is our joint scientific commission, the "North Atlantic Triangle". Just one highlight of this collaboration was the 2018 keynote lecture given by Chad Gaffield, former President of The Royal Society of Canada, on "Embracing Transatlantic Research Col-

laboration in a New Era" – a subject closely connected to our first panel.

This Joint Academy Day is another milestone in our ongoing and successful collaboration. I would like to thank the 30 academics who participated in our six panels, as well as Jeremy McNeil and Paul Young, President and International Secretary of the Royal Society of Canada.

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

I wish you a stimulating read.

JEREMY MCNEIL

Although we were not able to come to Vienna this year, we at the Royal Society of Canada greatly enjoyed the opportunity to engage in discussion with our colleagues at the OeAW.

The OeAW rests on three pillars: the Learned Society, the various institutes, and the Academy as funding body. The Royal Society of Canada has three academies: arts and human-

ities, social sciences, and sciences at large. This structure enables us to nurture and support research across a wide range of subjects, including some areas of technology. However, we are currently undertaking a major evaluation of membership and qualification in response to the question of interdisciplinarity, which is becoming increasingly important. We are thinking about how to integrate sciences, social sciences, arts and humanities – how to support those who truly work across disciplines.

The "fourth arm" of the Royal Society is the College, which is for younger scientists – much like the OeAW's Young Academy. Consequently, we do not just have the interdisciplinary dimension; we have the intergenerational one, too. Several of our speakers at this year's Joint Academy Day are active members of the College. It is a truly exciting dimension of our work.

I am sorry that this year's Joint Academy Day had to be a virtual one. However, if we have learned one thing from this pandemic, it is

that we can conduct these events in a more inclusive way in the future. That does not rule out meeting face to face. But if we can have those face-to-face meetings while offering them virtually at the same time, we will be able to enable many more people to participate: a whole new dimension of collegiality.

INTRODUCTION

PAUL YOUNG

The idea of this Joint Academy Day is to share ideas across the Atlantic and beyond. As our expert panel discussions show, collaborative science is essential – now more than ever. It has contributed to the rapid vaccine development of the last year, and hopefully it will provide solutions to the significant impacts of the pandemic on society going forward.

The topics of discussion across our six panels are timely and touch on crucial issues that face the global population. Beginning with the very first panel, on transatlantic exchange: a particularly apt note on which to start our meeting. We must work together if we are to tackle, not just the pandemic, but the interrelated global challenges of climate change and biodiversity loss. Academies in cooperation, across generations, can use their expertise to influence important government policy decisions that affect us all.

This applies to our two academies in Ottawa and in (real and virtual) Vienna as well as those of the G7, the G20 and other academy partnerships. For example, the United Nations Climate Change Conference (COP26) in November 2021 in Glasgow will set out to engage nations in collaboration to reach further agreements on these issues.

A lot has happened since January 2020, when the Royal Society of Canada accepted the OeAW's kind invitation to a Joint Academy Day. It took considerable determination – and close cooperation – to adapt our plans to the new circumstances. We would particularly like to thank Julia Weilinger, Bernhard Plunger, Anton Zeilinger and Oliver Jens Schmitt for the collegial and collaborative interactions we have had while organizing this event together. I hope that we can continue our discussions in Vienna at some point in the future.

OLIVER JENS SCHMITT

The program of this year's Joint Academy Day reflects both the diverse research interests of our two academies and the issues that emerge from the current global situation. The topic of Panel One, chaired by Waldemar Zacharasiewicz – who also chairs the "North Atlantic Triangle" commission – is the transatlantic exchange of people and ideas. Multiculturalism, migration and religious diversity are at the core of this discussion.

Chaired by Steven Cooke, Panel Two concerns interdisciplinary responses to global challenges. Food insecurity, global poverty and environmental change are all issues that can benefit from problem-solving approaches between and across disciplines. This discussion asks, among other things, how these approaches can be nurtured, enacted and framed.

The specific focus of Panel Three is on coping with the COVID-19 crisis. Professor of Infection Biology Sylvia Knapp chairs a discussion about the societal, political and economic repercussions of the pandemic. Key questions include how future pandemic management can better balance citizen rights and citizen health,

and whether tracking apps fulfil their promise. These first three panels are particularly apt for the conditions in which this year's virtual event took place.

Panel Four deals with an urgent and ongoing issue affecting our two countries: Alpine and Arctic environmental change. Referred to as the "miners' canaries of the planet", these two ecosystems are often the first affected by climatic changes. This panel is chaired by ecologist, limnologist and paleolimnologist John P. Smol.

The topic of Panel Five, chaired by Alice Vadrot, is free speech and free research. The new emphasis on academic and scientific research means that the traditional understanding of this coupling needs to be reappraised. Decreasing public trust in science, rapid scientific development and populist, anti-enquiry tendencies all complicate the current situation.

Chaired by Candace Nykiforuk, the sixth and final panel asks how we can build healthy societies. What makes a society healthy or unhealthy? How can we measure societal health? And what skills and experience will the next generation need to maintain a healthy society in the face of rapid global change?

Once again, we would like to thank everyone involved in preparing this event, with special – and very extensive – thanks to the Royal Society of Canada, who believed in this idea right from the beginning.

PANEL 1

IDEAS CROSSING THE ATLANTIC: MULTICULTURAL CITIZENSHIP, MINORITY CULTURES AND RELIGIOUS DIVERSITY AS CHALLENGES IN LIBERAL DEMOCRACIES

Chair:
Waldemar Zacharasiewicz, OeAW

Panelists:
Gerald Stourzh, OeAW
Rainer Bauböck, OeAW
Isabella Bakker, RSC
Gary Libben, RSC
Maria Löschnigg, OeAW

INTRODUCTION
WALDEMAR ZACHARASIEWICZ

We are aware of centuries of the transfer of people, commodities and ideas across the Atlantic and conscious of the fact that we share the same normative concepts in our liberal democracies. These values are currently under attack in many parts of the world. We are also cognizant of the many challenges in our own societies, and we know of the serious problems that arose on both continents in the past when the ideals of liberal democracies, which had their origin in this part of the world during the Enlightenment, were only imperfectly realized or even completely betrayed.

Our panel opens with the eminent Austrian historian **Gerald Stourzh**, who will consider the past as well as past attemps to consolidate the core of those values that might be called fundamental to liberal democracy. At the beginning of his career he studied the pertinent thoughts of the founding fathers of the United States, and since then he has also studied the jurisdiction concerning the equal rights of ethnic and national groups in the Dual Monarchy. He has focused on the protection of civil rights as an aspect of what he has labelled isonomy. He will speak on "constitutional jurisdiction on both sides of the Atlantic."

We are conscious of the rapid developments in our global village, where unresolved problems travel quickly from one continent to the other, and the consequences of crises in one part of the world affect the citizens of other countries. This results in the movement of many people who have lost their livelihood through climate change or political troubles. European observers have been conscious of the reform legislation enacted some fifty years ago which resulted in a liberal immigration regime in Canada, and the inclusion of multiculturalism in the Canadian constitution. The adoption of concepts such as the 'politics of recognition' within it has inspired liberal thinkers in Europe. Many have regarded multiculturalism as a model for European countries faced with a rapidly increasing number of immigrants and the appearance of new ethnic groups.

Among Austrian political scientists, **Rainer Bauböck**, chair of the Academy commission on Migration and Integration Research, has been in close touch with many Canadian colleagues on the intricacies of the concept of multicultural citizenship and the role of minority cultures. He will address the transfer of this concept to and its reception in Europe.

Isabella Bakker from the Department of Politics, York University, will analyze the way in which the concepts of multiculturalism and multicultural citizenship function in Canadian society and help restrain opposition to immigration there. As her research examines the interplay between feminist perspectives and public policy, and how macroeconomics and fiscal policy affect gender equity and social justice, she will touch upon issues that remain unresolved in Canada.

Canada has seen the arrival of millions of migrants from other continents over the last fifty years, and numerous visible minorities are firmly established in Canada. This fact, which is manifest in a high percentage of immigrants speaking their own languages, has resulted in cultural change. **Gary Libben**, a psycholinguist at the Department of Applied Linguistics at Brock University, has led research initiatives that seek to understand how words are represented and processed in the mind and brain. He also has insights to offer on the complex consequences of the bilingualism of immigrants as

agents of cultural change in Central Europe.

European students of Anglophone and Francophone literature written in Canada have been struck by the literary vitality of writers from these groups and have noted the recognition they have received through major awards in Canada. As an expert in Anglophone Canadian literature, **Maria Löschnigg** from the University of Graz has explored texts originating from such backgrounds, including migration narratives. She will speak about the reflection of cultural diversity in these texts, the struggle of individuals to enjoy the full benefits of citizenship, and the way in which their experiences are rendered communicable in literature. These texts have considerable appeal to European readers, and present them with the chance to develop empathy with individuals from different cultural backgrounds by observing the existential challenges migrants face. This may result in resistance to populist trends that denounce shifts in the demographic composition of European countries.

For literary and cultural scholars studying multilateral exchange across the Atlantic, continental Europe has contributed another useful approach:

namely, Imagology. This sub-discipline of Comparative Literature was developed by academics such as Hugo Dyserinck after World War II, expanded by his sometime disciple Joep Leerssen,[1] and applied by scholars such as the Austrian Anglicist F. K. Stanzel,[2] long before Benedict Anderson's *Imagined Communities* of 1983 attracted attention. Drawing on the insights of socio-psychology and showing the overt or covert use of auto-stereotypes and hetero-stereotypes in non-fiction and literary texts, these continental European scholars have analyzed the generation and dissemination of dubious notions of the typical character of nations and ethnic groups in and through literature.[3]

By alerting readers to processes by which questionable generalizations

complicate relations between ethnic and national groups, imagologists help to locate sources of conflicts which impede the recognition of the civil rights of groups and individuals. Imagology may thus help to curb the excesses of identity politics. It may give more space to the individual and thus counteract hostile views of the composition of societies with a number of minorities. That this discipline has still to achieve full currency in North America is apparent in some North American reviews of European monographs on the images of certain countries or nations.

GERALD STOURZH

Constitutional Jurisdiction on Both Sides of the Atlantic

During the second part of the twentieth century, constitutional jurisdiction – a more precise expression than "judicial review" – has become a powerful and important element of what we usually rather loosely term "liberal democracy". It first developed in the United States, beginning in the early 19th century. It emerged in Europe and the rest of the world much later, beginning in

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[1] See Manfred Beller and Joep Leerssen, eds. *Imagology: The cultural construction and literary representation of national characters*, Rodopi, 2007.

[2] See essays by Stanzel since the late 1960s, and his *Europäischer Völkerspiegel. Imagologisch-ethnographische Studien zu den Völkertafeln des frühen 18. Jahrhunderts*, C. Winter, 1999.

[3] See Waldemar Zacharasiewicz, *Imagology Revisited*, Rodopi, 2010, and *Images of Germany in American Literature*, Iowa UP 2007.

1867 in Austria, progressing in the interwar years and developing more fully after World War II. Canada joined the states with constitutional jurisdiction in 1982. As part of the "patriation" (a Canadian neologism) of the Canadian constitution – that is the capping of Canadian dependence on the sovereign power of the British parliament – the Canadian Charter of Rights and Freedoms was constructed as part I of the new constitution. In a recent definition, the brilliant Canadian jurist Jacob Weinrib of Queen's University named a basic condition of the constitutional state: the existence of a "politically independent judicial body to which any individual can bring a constitutional complaint challenging the validity of any exercise of public authority on the grounds that it violates constitutional right".[4]

First: Everyone knows about the case of Marbury v. Madison in 1803 as the beginning of judicial review in the US. Much less is known about precedents in the individual states before the creation of the federal constitution.

The most significant precedent is the little-known North Carolina case of Bayard v. Singleton in 1786-87, which should be more widely known. One lawyer involved in the case was the British-born James Iredell, later appointed by President Washington as a justice of the first Federal Supreme Court. Iredell argued in favour of the duty of the judges to pronounce judgment as to whether a legislative Act had violated the constitution or not. "It will not be denied that the constitution is a law of the state, as well as an act of Assembly, with the difference only that it is the fundamental law, and unalterable by the legislature." Iredell further argued: "An act of Assembly, inconsistent with the constitution, is *void* and cannot be obeyed without disobeying the superior law to which we were previously and irrevocably bound".[5] Now, this is one of the most forceful justifications of the judicial review of legislation.

Second: Things in Europe developed quite differently. We have to go back to the Revolutions of 1848/49. The German draft constitution of 1849 contained a paragraph, according to which "complaints of German citizens regarding violations of rights granted them by the Empire's constitution" had to be decided by the Empire's Court (*Reichsgericht*). A slightly different formulation found its way into the Austrian draft constitution of 1849, yet neither draft constitution was ever implemented.[6] However, Austria did get a new constitution in 1867, due to the transformation of the Habsburg Empire into the Austro-Hungarian dual monarchy. There it was provided that a newly created *Reichsgericht* – a Court of public law separate from the Supreme Court – was empowered to hear appeals of citizens regarding violations of the political rights guaranteed to them by the constitution.[7] So here we have the first constitutional complaint to

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4   Jacob Weinrib. *Dimensions of Dignity. The Theory and Practice of Modern Constitutional Law*, Cambridge: Cambridge University Press, 2016, 137.

5   James Iredell, „To the Public", published in Newbern, NC, August 17, 1786, republished in: *Life and Correspondence of James Iredell*, ed. by Griffith McRee, New York, 1858, II, 147-148. See now also Sylvia Snowiss, *Judicial Review and the Law of the Constitution*. New Haven, CT: Yale University Press, 1999, 45-53.

6   For more detail and the context see Gerald Stourzh, *Modern Isonomy. Democratic Participation and Human Rights Protection as a System of Equal Rights*. Chicago: University of Chicago Press, 2021.

7   Ibid.

go directly to a supreme court anywhere! The Court did have the power of declaring certain acts of the public administration unconstitutional; but it did not have the complementary power of pronouncing the unconstitutional acts *no longer valid.* In spite of this, the constitutional complaint played a key role in imperial Austria from 1867 to 1918. One constitutional right was the equality of the ethnic groups of the country.[8] A consequence was a great number of constitutional complaints concerning the equal rights of ethnic groups, about which I have written a book, unfortunately not available in English.[9] The additional power to declare unconstitutional provisions *void* was granted only after the end of the Habsburg Monarchy in early 1919, to a newly established court called the *Constitutional Court*. Thus, Austria became the first country in the world to have a constitutional court[10] of that name.

From that moment on, we have two systems in the world: the American system (first the USA, after 1982 also Canada), where the Supreme Court also assumes the task of a constitutional court; and the Austrian system, as it is sometimes called, or generally European system with specialized constitutional courts. The real triumph of constitutional jurisdiction came after the end of World War II, with constitutional courts being created in Italy (constitution of 1947) and Germany (*Grundgesetz* of 1949), and subsequently in many other European countries – after 1989 particularly in the ex-Soviet countries – and in many parts of the world. In most of these countries the constitutional complaint plays a very great role. In Germany, more than 95 % of cases reaching the court are constitutional complaints by individuals.

Third: The patriation of the Constitution to Canada in 1982 and the construction of the Charter of Rights and Freedoms as part I of the Constitution, at the time of Pierre Trudeau's second premiership, is certainly a major, perhaps the most important

constitutional change in the Atlantic world in the 20th century. Superficially, one might say that Canada has gone over from the "British" system of government (a Law of the British Parliament is the supreme law) to the "American way" of government with two levels of law, ordinary law and constitutional law. But there are differences. The Canadian Charter of Rights and Freedoms is much more detailed in the enumeration of rights than the US Constitution.[11] There is one well-known flaw in the Canadian Charter, section 33. It empowers the parliaments of the provinces or of the central government to suspend the constitutional guarantees of certain rights in section 2 and sections 7 to 15 of the Charter for the duration of five years with the possibility of prolongation. Among other things, fundamental rights such as the freedoms of expression, religion or association may be suspended; democratic rights and language rights may not be touched. Section 33 has been invoked by some provinces, but never by the central government. In contrast the inclusion of provisions

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8   "Fundamental Law on the General Rights of the Citizens" of 1867 (part of the constitution), article 19, points 1 and 2.

9   Gerald Stourzh, *Die Gleichberechtigung der Nationalitäten in der Verfassung und Verwaltung Österreichs 1848-1918,* Vienna 1985.

10   In Italy, there is no provision for a constitutional complaint. Therefore, the number of

Italians appealing to the European Court of Human Rights in Strasbourg is especially great.

11   The Canadian Constitution including the Charter of Rights and Freedoms is available on the internet.

for the encouragement of "affirmative action" (section 6,4 and 15,2) is a welcome innovation and has been upheld by the courts. In a notable case in 1987, the Canadian Supreme Court upheld section 15(2) against a complaint of the Canadian Railway Company about the fact that it was obligated to hire at least one woman among four persons when filling an unskilled blue-collar job. The Court rejected the railway company's complaint in favour of the "affirmative action" principle enshrined in the Charter and, in this case, protected women.[12]

Finally, the constitutional complaint of individuals whose rights or freedoms under the Charter have been infringed or denied to apply "to a court of competent jurisdiction" is guaranteed in section 24 of the constitution. Thus, the Canadian Constitution corresponds to the principle laid down by Professor Weinrib mentioned at the beginning, and with which I also conclude – that, as one of the fundamentals of a constitutional state, there must be "a politically independent ju-

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[12] Canadian Railway Co v Canada (Human Rights Comm) and Action travail des femmes, 8 C.H.R.R. D/4210 (S.C.C). A summary is available on the internet, and there is also a Wikipedia article on the case.

dicial body" "to receive constitutional complaints of individuals".

RAINER BAUBÖCK

Multicultural Citizenship: A Canadian Idea Crossing the Atlantic and Its European Reception

Canada was the first country worldwide to declare itself officially a multicultural nation. In October 1971, Prime Minister Pierre Trudeau made multiculturalism an official policy of the federal government. Australia was the next country to adopt the concept as a label for government policy from 1973. European states followed with considerable delay, with the Netherlands, Sweden and UK being the only three countries where multiculturalism was officially embraced to some extent in the 1980s and 1990s. Remarkably, all the other states have since more or less abandoned the concept, even if few of the policies that were introduced under this label have been reversed. In the early 2000s and in the wake of the terrorist attacks of 9/11, several prominent European political leaders, among them those of Germany (Angela Merkel) and France (Nikolas

Sarkozy) that had never adopted official multiculturalism in the first place, declared the idea dead and policies pursuing it as having failed. Only Canada still proudly proclaims itself to be a multicultural nation with official multicultural policies.

Even in Canada, however, the concept was always contested. Conservative critics resented the symbolic downgrading of national majority cultures whose dominance in the public sphere had previously been taken for granted. Others suggested that multicultural policies would lead to a splintering of the wider society into what was later labelled "parallel societies". Left-wing critics focused on the privileging of ethnocultural and religious differences and regarded multicultural policies of recognition as distracting from policies of redistribution aimed at reducing social inequalities of class, race and gender. Multiculturalism was also blamed for declining solidarity in democratic welfare states. All of these charges have resonated strongly in Europe, where they have put advocates of multiculturalism on the defensive.

Canada has, however, not only pioneered multicultural policies and their contestation in public debates, it has also produced the most influ-

ential body of normative political theories on multiculturalism. After pioneering work by the US American Iris Marion Young[13], the most important early theoretical works came from Canadians, especially Charles Taylor[14] and Will Kymlicka.[15] I would also mention here another Canadian, Alan Patten, whose more recent book provides another comprehensive defence of multiculturalism using the methods of analytical philosophy.[16] Apart from UK-based authors – most prominently Bhikhu Parekh and Tariq Modood as promoters of multiculturalism and Brian Barry as its critic –, no others have been as influential as these Canadian scholars; and many more Canadian names could be added to the list.

The reception of these works outside Canada even among their admirers has often suggested that they reflect a peculiarly Canadian context: first, the intersection of three types of diversity (two territorially concentrated major language groups, a large number of semi-autonomous Indigenous peoples and a huge variety of ethnic groups of immigrant origin); second, Canada's openness to immigration (one of the few Western democracies where majorities tend to favour more immigration rather than less); and third, the less prominent role of slavery and racism in its history compared to its larger southern neighbour (though not of oppression of Indigenous peoples). Kymlicka's theory in particular has often been dismissed as not applicable outside the Canadian context.

As an aside and example for the reverse flow of ideas across the Atlantic, I want to mention that Canadian scholars have also been receptive to political theories about cultural diversity that originated in the late Habsburg monarchy. In particular, the work of Austro-Marxists Karl Renner and Otto Bauer on "national cultural autonomy" as a political response to nationality conflicts has resonated with scholars looking for

institutional arrangements for dispersed language groups (Indigenous and immigrant ones) or those who wanted to rehabilitate ethnocultural nationalism in a tamed form that denies its territorial claims.[17]

Let me conclude with a brief reflection on a more recent development. Whereas in the early 2000s multiculturalism was proclaimed dead, more recently it has been revived in a completely unexpected way by right-wing populist governments and intellectuals. As early as the 1980s, French extreme-right thinkers like Alain de Benoist proclaimed a "droit à la différence" on behalf of national majorities that had a right to defend their cultural traditions against threats from immigration and ethnic and racial mixing. More recently, these same ideas have been remodelled into the concept of "cultural majority rights", the more intelligent advocates of which test Canadian political theories of minority rights by applying their principles to the claims of cultural

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[13] Young, I. M. (1990). *Justice and the Politics of Group Difference*. Princeton, Princeton University Press.

[14] Taylor, C. (1992). *Multiculturalism and the Politics of Recognition*. Princeton, Princeton University Press.

[15] Kymlicka, W. (1989). *Liberalism, Community, and Culture*. Oxford, Oxford University Press; Kymlicka, W. (1995). *Multicultural Citizenship. A Liberal Theory of Minority Rights*. Oxford, Oxford University Press.

[16] Patten, A. (2014). *Equal Recognition. The Moral Foundations of Minority Rights*. Princeton, Princeton University Press.

[17] See the many Canadian contributions in Dieckhoff, A., Ed. (2004). *The Politics of Belonging. Nationalism, Liberalism, and Pluralism*. Lanham, MD, Lexington Books and Nimni, E. (2005). *State and Nation. National Cultural Autonomy and Its Critics*. London, Routledge: 13-41.

majorities.[18] Multiculturalism thus seems to have been turned upside down. Enunciated in the 1990s as a theory and policy of cultural minority rights, its language of cultural victimhood, oppression and alienation, and the corresponding claims to cultural self-determination, recognition, and protection are now being hijacked by politicians and intellectuals claiming to speak on behalf of national majorities. This phenomenon is not limited to Europe and North America. In India, Hindu nationalism is used as a justification for undermining the secular constitution and depriving Muslims of access to citizenship. In 2018, the Knesset passed a law declaring Israel to be the nation-state of the Jewish people that cast doubts on the country's commitment to treat its twenty-percent Arab/Palestinian minority as equal citizens.

Scholars interested in the normative justification of cultural-minority rights should not merely reject these misappropriations of their ideas. They should also self-critically review

Canadian theories of multiculturalism and ask whether certain foundational elements may have laid them open to this abuse. My own view is that it is not the defence of rights of minorities or the emphasis on the positive value of diversity in liberal democracies that ought to be reconsidered, but culturalist justifications for the pursuit of such values. I suggest that the culturally neutral values of individual liberty, equal citizenship and collective self-government suffice to justify cultural freedom rights for everybody, cultural rights for disadvantaged minorities, and powers and duties of territorial governments to establish a pluralistic public culture that includes all citizens. I contend that this covers all cultural rights that can be defended on the basis of liberal and democratic principles.[19] This argument does not leave any space for specific cultural majority rights. It fully retains the positive emphasis on the "multi" in multiculturalism while casting some doubts on the "culturalism" part of the concept. Affirming the liberal democratic values at the basis of multiculturalism may also

help to avoid the unproductive "culture wars" that have been waged by both conservatives and progressives.

ISABELLA BAKKER

Multicultural Citizenship as Policy and Ideology: Some Reflections

Multiculturalism – a policy and ideology developed in several stages in Canada since 1971 – "has managed to inscribe the immediate reality of a multi-ethnic society into Canadian public discourse and Canadian consciousness" (Knopf, 2005: 7)[20].

Initially driven by Quebec's struggle for independence, demands from the Indigenous population for self-government and cultural autonomy, and the rise of immigrants from non-European countries, the policy aimed to accommodate all citizens. Multiculturalism also served as a riposte to confirm that we were not the great US melting pot, but a society reflecting cultural pluralism.

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[18] Patten, A. (2020). 'Populist Multiculturalism. Are There Cultural Majority Rights?' *Philosophy and Social Criticism* 46(5): 539–552; Ruud Koopmans and Liav Orgad (eds.) *Majorities, Minorities, and the Future of Nationhood,* Cambridge University Press, forthcoming.

[19] Bauböck, R. (2021) 'Are There Any Cultural Majority Rights?' in: Koopmans and Orgad, op. cit.

[20] Knopf, Kerstin. (2005) "Oh Canada": Reflections of Multiculturalism in the Poetry of Canadian Women Dub Artists." *Revue Lisa: Views of Canadian Cultures*. III (2): 78-111. (https://journals.openedition.org/lisa/2562?lang=enCachedSimilar1This#ftn12)

I wish to approach the questions of multiculturalism and the politics of identity from a social science perspective; and, I should add, not as an expert in this area but as a critical political economist. In the spirit of transatlantic dialogue, I wish to offer four brief points of critical intervention that highlight the specificities of Canada's multiculturalism and suggest some of the limits of its portability across the Atlantic.

The first point, drawn from Evelyn Kallen, suggests "…that Trudeau's 'policy of multiculturalism with a bilingual framework' represents in fact 'a clear division between private and public sectors' wherein multicultural subjects are required or exposed to the norm of two official languages in public whilst retaining their own cultural practices in private; thus upholding cultural essentialism and denying various cultural practices as collective public rights.[21] As Knopf notes, "The policy constitutes linguistic rights and institutional obligations with respect to the norms and practices of the dominant two Charter groups (English and French), without granting various cultural practices as collective public rights" (2005: 2).

Secondly, multiculturalism has not really addressed our legacy of settler colonialism: something absent from the mainstream discourse of social harmony and respect for diversity. As David MacDonald notes, "…multiculturalism sits uneasily with many Aboriginal people in part because multiculturalism as promoted from 1971 was not designed to recognize Aboriginal distinctiveness but developed from the same liberal traditions that created the assimilationist *White Paper* of 1968 with a desire to convert collective rights into individual ones" (2014: 66-67)[22].

Multiculturalism fails to recognize the inherent rights of Indigenous peoples, for example to collective property and its subsequent dispossession, which existed before settler colonialism and remain, as Patrick Wolfe has argued, not a past event but an ongoing structure. Multiculturalism aligns these original rights and resources alongside a politics of recognition that is equated with ethnic communities and cultural pluralism. This contrasts with Indigenous demands for the recognition of treaty rights, reparations for genocidal cultural practices such as residential schools,[23] and self-government.

Thirdly, if we go beyond cultural retention and turn to the second object of multiculturalism – social equality (and necessarily political and economic equality) – at this moment of the pandemic, we might as well ask: how are immigrants integrated into Canada's labour market compared to the dominant Eurocentric groups? COVID-19 has intensified the trend of the past few decades towards precarious employment; and research

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[21] In Quebec, Bill 21 passed by the majority French-speaking legislature, bans some public sector employees from wearing religious symbols during work hours arguing it triggered a "politics of fear" in the province. See https://www.theguardian.com/world/2019/jun/17/quebec-law-hijab-ban-religious-symbols-public-employees

[22] MacDonald, David. (2014) "Aboriginal Peoples and Multicultural Reform in Canada: Prospects for a Binational Society." *Canadian Journal of Sociology*. 39 (1): 65-86.

[23] Residential schools (1880-1996) were government-sponsored religious schools designed to assimilate Indigenous children to Euro-centric culture. Children were removed from their homes and often transported long distances for these schools where their culture and language were denigrated and they were physically punished and sexually abused. These schools had a long-term impact on Indigenous communities (see https://www.thecanadianencyclopedia.ca/en/article/residential-schools)

shows that, during economic crises those most marginalized and excluded – women, immigrants, people with disabilities and racialized people – suffer the most and are exploited the most. And, despite lockdowns where people are asked to stay at home, essential workers in health care, transportation, online shopping suppliers, etc. do not have this option. Many go to work sick because they have little or no paid sick leave; and despite the mixed public health message, governments have not stepped in. Most of these essential workers are from visible minority and often multi-generational households. According to Himani Bannerji, this further illustrates that multiculturalism translates issues of racism and structural inequality into cultural diversity. Whilst some argue that multiculturalism as a policy was never meant to address structural inequalities, one can nevertheless argue that it serves to diminish or invisibilize structural, economic, and social inequalities based on notions of diversity (Bannerji, 2000: 45-48).[24]

Finally, I want to briefly comment on the diversity/redistribution tension that underpins the multiculturalism promise. Banting (2010) calls this tension the progressive's dilemma, signalling a potential trade-off between support for multiculturalism and support for redistribution. For instance, citing the case of the Netherlands, there may be fear that immigration and ethnic diversity are eroding social solidarity and fragmenting the historic coalitions that built the welfare state, leading to the majority population withdrawing political support for resources for newcomers (2010: 797).[25]
Contrary to much of the Western world, especially Europe, there has not yet been a widespread backlash against immigration or the fear that ethnic diversity is eroding social solidarity in Canada (here again, Quebec is a more complex case – see footnote 24). Currently, annual immigration in Canada amounts to around 300,000

new immigrants – one of the highest rates per population of any country in the world. India was by far the main source country of new immigrants to Canada in 2019. China was the second leading source country, followed by the Philippines, Nigeria, the United States, Pakistan, Syria, Eritrea, South Korea, and Iran.[26] So, unlike most Western societies, Banting has found that the trade-off feared by progressives between multiculturalism and redistribution has not happened.
Why? He suggests that the public policies of the "incorporation regime", which consists of policies designed to facilitate the incorporation of newcomers and minorities (i.e., immigration policy, integration policy and universal social policy), have nurtured attitudes that reinforce the multiculturalism identity that provides a kind of cultural glue binding ethnic diversity and support for redistribution:
"Immigration policy minimized the dependence of newcomers on social support, providing less room for attacks on immigrants as a burden on

[24] Bannerji, Himani. (2000) "The Paradox of Diversity: The Construction of a Multicultural Canada and 'Women of Colour'," *in* Bannerji

Himani, *The Dark Side of the Nation: Essays on Multiculturalism, Nationalism and Gender.* Toronto: Canadian Scholars' Press, 15-61.

[25] Banting, Keith. (2010) "Is There a Progressive's Dilemma in Canada? Immigration, Multiculturalism and the Welfare State." *Canadian Journal of Political Science* 43 (4), December. 797-820.

[26] See https://www.statista.com/topics/2917/immigration-in-canada/

the country.[27] Integration policy represented a state-led transition to a multicultural conception of the country, building on identity, which has helped protect the welfare state from anti-immigrant sentiments. And universal social programs reduced the exposure of immigrants to the politics of welfare chauvinism. In combination, the incorporation regimes helped keep the progressive's dilemma at bay" (Banting, 2010: 814)[28].

These observations were written in 2010, well before the global economic and health crisis we are now living through. The extent to which this pol-icy regime will hold will, in great part, depend on the kind of policy framework developed in the post-pandemic period. If austerity rather than expansionary Keynesian is the response to sovereign debt squeezes, we know from the post-2008 reaction that welfare states and other mechanisms of progressive redistribution (versus regressive redistribution upwards for the 1% via their financial assets) are targeted, and then potentially social tensions may mount, and the incorporation regime will be reconfigured. This implies a politics of recognition that is at best symbolic without the financing of social inclusion. Yet the cultural glue of multiculturalism is a strong one, and has become a part of the Canadian discourse of national identity. This suggests that the conversation will continue about who we are and what it means to adapt to such a diverse country.

From the fiscal perspective of the welfare state and the other policy instruments of the incorporation regime, broader questions are raised about how to finance the politics of inclusion, recognition and substantive equality. As the Austrian fiscal theorist Rudolf Goldscheid pointed out in 1925 in his essay "A Sociological Approach to Problems of Public Fi-nance," democratizing public finance – that is, developing democratically owned forms of public wealth creation rather than continually relying on the state's dependence on taxes drawn from the incomes and profits of the wealthy – would create the potential for a post-pandemic moment of progressive policies that would uphold the redistribution bargain.

GARY LIBBEN

Words Matter: Psycholinguistics and Cultural Change

Both Austria and Canada are countries of immigration.

Fifty years ago, the population of Canada was 21.3 million. It is now almost 38 million[29]. Yet, in all but four of those fifty years, the birth rate in the country has declined. Clearly, Canada's population growth has been driven by immigration.

During the same period, the population of Austria has also grown (7.45 million in 1970; over 9 million at

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27 For example, a private sponsorship program was initiated by the federal government during the outset of the Syrian refugee crisis. This program lets private groups (neighbours, friends, families, sponsor eligible refugees from abroad for up to one year and part of the sponsorship commitment includes start-up costs such as furniture and clothing, cost for basic necessities such as housing, food and public transportation as well as social and emotional support. See https://www.canada.ca/en/immigration-refugees-citizenship/services/refugees/help-outside-canada/private-sponsorship-program.html

28 Banting, Keith. (2010) "Is There a Progressive's Dilemma in Canada? Immigration, Multiculturalism and the Welfare State." *Canadian Journal of Political Science* 43 (4), December. 797-820.

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29 Source: https://www.macrotrends.net/countries/CAN/canada/population

present[30]). Both countries are highly sought destinations for immigration. Vienna has consistently been at the top of the Economist Intelligence Unit's global liveability index[31]. This has created pervasive multiculturalism in its largest cities.

According to the statistical report of Stadt Wien, the average share of Vienna's foreign-born population was 41.3 per cent in 2020[32]. This rate reflects the fact that 35% of Austria's new immigrants come to Vienna[33]. That is comparable to the percentage for Toronto, the city to which most of Canada's immigrants move[34]. Toronto is an extraordinarily multicultural city. According to Statistics Canada, already in 2016, the majority of the city's population (51.4%) was born outside Canada[35].

Bilingualism has subtle cognitive effects that create cultural consequences.
The data summarized above provide us with important indicators of changes that have already occurred in both Austria and Canada and an indication of the kinds of changes that still will occur. Many of those changes are linked to language use and to the manner in which concepts and their connections are represented in the minds of individual residents. My own research field, psycholinguistics, is the study of the mental representations and processes that are associated with language activity. Recent work in this field has shown that research on language processing can be mobilized to understand and characterize mechanisms related to cultural change. This is particularly true when bilingualism is involved.
From a psycholinguistic perspective, the dominant characteristic of the residents and immigrants discussed above is that they speak at least two languages. As reported by Statistics Canada, about 70% of Canadian immigrants report a language other than English or French as their mother tongue. About 93% of these were able to conduct a conversation in English or French. Importantly, immigrants were much more likely than Canadian-born residents to report knowing more than one language. In the 2016 Canadian census, 76.4% of immigrants reported knowing at least two languages. In contrast, 27.5% of non-immigrants reported knowing at least two languages [36].

I would like to suggest that the bilingualism of immigrants makes them important agents of cultural change, perhaps even cultural transcendence. The reason for this lies in the psycholinguistics of bilingualism. Although it might seem at first blush that the hallmark of effective bilingualism is the ability to keep two languages separate, at a deeper cognitive level, it is rather the opposite. The languages of a bilingual person, whether that person is speaking or hearing, writing

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30 Source: https://www.macrotrends.net/countries/AUT/austria/population

31 Source: https://www.eiu.com/topic/liveability

32 Source: https://www.wien.gv.at/english/social/integration/facts-figures/population-migration.html

33 Source: https://www.austria.org/population

34 Source: https://www150.statcan.gc.ca/n1/daily-quotidien/171025/t001b-eng.htm

35 Source: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CMACA&Code1=462&-Geo2=PR&Code2=01&Data=Count&Search-Text=Montreal&SearchType=Begins&Search-PR=01&TABID=1&B1=All

36 Source: https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016017/98-200-x2016017-eng.cfm

or reading, are always active[37]. This is likely why false cognates such as the English word *gift,* which is something one would be happy to receive and the German word *Gift* (which means 'poison') are so problematic. Thus, although a person may speak many languages, each with their own vocabulary, at a deeper cognitive level such a multilingual person has a single cognitive vocabulary store, or mental lexicon. I have called this the Homogeneity Hypothesis[38].

The Homogeneity Hypothesis has immediate consequences for how bilingualism and immigration are drivers of cultural change. It suggests that every new word that is acquired in a new language changes a person's vocabulary system as a whole. This is because, within an integrated mental lexicon, everything is dynamically connected to everything else.

The complexity and dynamicity of a person's lexical system are related to the vocabulary growth that accompanies bilingual development. New immigrants to Austria or Canada, even if they already speak an official language of the country upon arrival, will need to learn many new words. As a result of that learning, they change who they are. They understand in new ways and see the world in new ways – they are engaged in the creation of new cultures.

The scale of change can be appreciated by considering the size of the network. It has been estimated that an average native speaker of English will know about 42,000 words (lemmas) by age 20 and about 49,000 words by age 60[39]. This means that the possible number of within-lexicon connections at age 20 will be about 882 million and about 1.2 billion by age 60. These are amazingly large numbers considering that we have not yet added to them the indisputable fact that somebody who

learns new words in adulthood adds significantly to their vocabulary. Thus, the Homogeneity Hypothesis predicts that the consequence of adding 100 words of a second language to your vocabulary is not simply $n(n-1) = 100 \times 99 = 9,900$ new connections, where n is equal to the number of new words learned. Rather, it is where n is equal to the total number of words known. Thus, for bilinguals or highly educated people, who could easily be expected to have vocabulary sizes of at least 60,000 words, the acquisition of 100 new words could result in over 12 million new connections.

From this perspective, learning a new word is not simply a matter of adding knowledge. It is a matter of enriching and re-balancing the meaning network. Because it affects all of a person's languages, it forces a restructuring of the system as a whole, creating the opportunity for cultural transcendence.

New and developing research opportunities

In recent years, new developments have created opportunities to link lexical processing and cultural aspects of bilingualism. New platforms such as PsychoPy3 enable psycholinguistic experiments to be conducted

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[37] Libben, M., Goral, M. & Libben, G. (2017). The dynamic lexicon: complex words in bilingual minds. In Libben, M., Goral, M. & Libben, G. (Eds.) *Bilingualism: A Framework for Understanding the Mental Lexicon*. John Benjamins (pp.1-8).

[38] Libben, G. (2000). Representation and processing in the second language lexicon: the homogeneity hypothesis. In J.A. Archibald (Ed.) *Second language grammars* (pp. 228-248). Blackwell Press.

[39] Brysbaert, M., Stevens, M., Mandera, P., & Keuleers, E. (2016). How many words do we know? Practical estimates of vocabulary size dependent on word definition, the degree of language input and the participant's age. *Frontiers in psychology*, *7*, 1116.

online[40, 41]. We have also seen a great many more studies of psycholinguistic processing making use of large corpora of speech and writing. In my view, the analyses of these corpora create unprecedented opportunities to connect language processing to the social, cultural and political context in which it occurs.

Another branch of developing research that I consider to have cultural consequences involves the study of written production itself. Together with Prof. Wolfgang Dressler, a member of the Austrian Academy of Sciences, we have recently reported an analysis that links cognitive activities with written text production[42]. In my view, the psycholinguistic analysis of written production offers a technique that could be very reveal-

ing of cultural aspects of cognition and language processing.

To summarize, I began this report by noting that both Austria and Canada are countries of immigration. Canada's largest city, Toronto, already has more residents who were born outside Canada than residents who were born within Canada. The statistics for Vienna approach those levels. In both cases, the majority of immigrants are not native speakers of German (in the case of Austria) or French or English (in the case of Canada). These facts create conditions under which cultural change is very likely because cultural change accompanies bilingual lexical development. Psycholinguistic research can serve as a tool to understand and characterize that change. This situation is certainly not unique to Austria and Canada. Thus, together, we have an opportunity to create knowledge that can be used around the world.

MARIA LÖSCHNIGG

Migration, Citizenship, Cultural Identities: Some Literary Reflections

While political science, history, economy and sociology focus on the demographic and sociocultural impli-

cations of migration and explore the constitutional roots and complex genesis of multicultural societies, literature fulfils a different function.

It is in literature, as a form of cultural practice, that the human factor of migration expresses itself. Thus, writers use the fictionalizing of experience in order to deal with the affective dimension of migration. They make use of literature's potential to offer internal and multiple perspectives, to create evocative images and devise intricate narrative configurations in order to address issues such as transcultural identities, generational conflicts, problems of acculturation, racism and cultural stereotyping, and the liminal cultural space between here and there, and now and then. In my contribution from the perspective of literary studies, I shall illustrate this aesthetically grounded potential with the help of three examples from Canadian short fiction: 1) the rhetoric of evocative metaphoric configuration; 2) the letter as an example of the meaning-making significance of narrative voice, and 3) the short story cycle as an example of how genre as such can be a form of meaning.

Let me come to my **first point**: Since the short story shows a tendency towards concentration that does not

40 Peirce, J. W., Gray, J. R., Simpson, S., MacAskill, M. R., Höchenberger, R., Sogo, H., Kastman, E., Lindeløv, J. (2019). PsychoPy2: experiments in behavior made easy. Behavior Research Methods. 10.3758/s13428-018-01193-y

41 Gallant, J. & Libben, G. (2019). No lab, no problem. *The Mental Lexicon,* 14(1), 152–168.

42 Libben, G., Gallant, J., & Dressler, W.U. (2021). Textual Effects in Compound Processing: A Window on Words in the World. *Frontiers in Communication.*

allow for much of the arbitrary, it invites the multi-layered arrangement of imagery. It thus creates a condensed pattern of signification that is often metaphoric. This pattern has been employed by Canadian authors in order to translate precarious emotional states into concrete images, images which make the experience of cultural dislocation or of a liminal state between two (or more) cultural frameworks understandable for the reader. In particular, forms of chronic or quotidian suffering, which often accompany experiences of displacement and which are marginalized in public discourses due to their lack of a tangible impact, are given voice in short fiction.

A writer who may serve as an example here is Italian-Canadian author Caterina Edwards. The six stories collected in *Island of the Nightingales* (2000) can, in fact, be seen as variations on being Italian-Canadian; they defy stereotypical notions of 'Italianness', capturing instead the multiple effects of migration on the 'ethnic' subject. Moreover, the stories foreground gender as a decisive factor in the Italian diaspora. In "Prima Vera", for example, fantasies of speed and running on the part of the female protagonist Maria, an Italian immigrant in Canada, are consistently juxtaposed to her paralysed state, concretized in her pregnancy. Space and climatic conditions are strongly semanticized in the story emphasizing the sterility and coldness of Canada as opposed to Maria's nostalgic remembrance of Prima Vera, the Italian Spring. While her pregnancy and its discomforts signify her home*sickness*, the act of giving birth becomes a compelling image of her painful but eventually successful acculturation.

That immigration affects women differently from men is even more explicitly suggested in "On a Platter", where Fulvia's emigration is rendered as an act of liberation from the suffocating moral codes and family ties still to be found in rural communities in Italy. However, her repression of her heritage eventually materializes in breast cancer. Fulvia, in the end, realizes that the past will keep haunting her unless she accepts it. The two stories both demonstrate how configurations of images may evoke the psychological complexities of the immigrant experience.

Regarding my **second point,** I want to briefly comment on the multifunctional use of epistolary elements in fictions addressing migration and cultural/ethnic otherness. In these narratives, the letter becomes a materialized space to denote both distance and connection and to reflect the push and pull factors that migrant experiences may involve. R. Maharaj's "The Diary of a Down-Courage Domestic", and A. Clarke's "Waiting for the Postman to Knock" and "Four Stations in His Circle", may serve as examples here.

In Maharaj's story, the letters between Irma (who has come to Canada as a domestic) and her husband Paul (who has stayed in Trinidad) fulfil various functions: they denote the gap between Trinidad and Canada, which they also try to bridge. They represent the liminal space between here and there, and create polyvocality. Writing, moreover, acquires a therapeutic function, while Irma's ironic depiction of the frequently materialistic and patronizing attitudes of Canadians bears ample critical potential.

Like Irma, Enid in Clarke's "Waiting for the Postman", is a Caribbean domestic in Canada. Here, however, the epistolary form is used to render the plight of an individual faced with bureaucratic anonymity, as Enid tries to explain her dire situation to a real estate company. The letter form adopts yet another function in Clarke's "Four Stations". Here, a letter from the main character's mother, which is

burned and never answered, stands for the pull of the culture of origin and is symptomatic of the protagonist's obsession with erasing his Caribbean heritage in order to pass as a 'proper' Canadian.

Let me now conclude with my **third point**, the short story cycle as a form of meaning-making.In contrast to the novel, the short story cycle represents unity *and* disunity, and features a fragmented temporal sense. When it comes to life stories, the breaking up of novelistic trajectories in favour of refracted episodic structures seems particularly suitable to the rendering of migrant lives, emphasizing the disruptive experience of migration.

A number of Canadian authors have encoded narratives of migration and cultural displacement in sequential modes of short fiction. Since there is no space here to elaborate on the diverse ways in which authors have employed the short story cycle to render lives affected by migration, let me just mention some titles, such as: D. Bezmozgis' *Natasha* (2004), M. Silvera's *Remembering G.* (1991), and A. Munro's *The View from Castle Rock* (2006). These are all examples of autobiographical fiction where episodic 'storification' mirrors the fragmentation of lives through migration.

Like the inclusion of letters, the short story cycle, too, lends itself to polyvocal and multiply perspectivized narration, thus combining different experiences and establishing meaningful relations between them. Examples of this type of short story cycle are R. Mistry's *Tales from Firozsha Baag* (1987), T. Watada's *Daruma Days* (1997), and R. Mara's *Of Customs and Excise* (1991).

Canadian authors, as I have shown, draw from the rich inventory of aesthetic expression in order to render the emotional aspects of migration as well as the complexities of multicultural interaction within national frameworks. I have concentrated on configurations of evocative images, the use of specific narrative forms like the letter, and of genres like the short story and the short story cycle. It goes without saying that these represent only a segment within the very wide spectrum of creative literary expression.

DISCUSSION
WALDEMAR ZACHARASIEWICZ

May I begin the discussion with a question that goes back to the multiculturalism debate in the United States in the 1990s, when David Hollinger and other cultural historians argued for a post-ethnic society. Has this intervention, made over 25 years ago and since expressed in various publications, reduced the urgency of the many problems we observe in migration societies, both in liberal democracies like Canada and perhaps, also, on this side of the Atlantic?

RAINER BAUBÖCK

As the political scientist on this panel, I might as well attempt an answer. I think David Hollinger's diagnosis and prognosis of a post-ethnic society was a little bit over-optimistic. The idea of multiculturalism really took off intellectually in the early 1990s. It was invented, as we discussed before, as a public policy, but it became a big intellectual idea that travelled across the Atlantic in the 1990s. Yet later, in the 2000s, multiculturalism was accused of not being post-ethnic at all and of segmenting society instead into distinct cultural, religious and ethnic groups. That was the European perspective much more than the original intent of the policy, at least in Canada.

There was always some discussion between the Canadian theorists and David Hollinger. I remember very well, when Hollinger said that there is a danger in Canadian multiculturalism and that it would lead to a segmentation of ethnic groups; a pluralism of difference, rather than hybridity. But in the 1990s, the feeling, including in the field of cultural studies, was that post-ethnicity and hybridity would be the natural results of a multicultural, dynamic and diverse society in which groups of immigrant origin increasingly mingle with the native population - which, in the Canadian context, was already so diverse in composition. I have to say that it has not quite worked out this way. Rather, we have seen a consolidation of cultural boundaries in public discourse. This is partly due to a political backlash connected to the failure of the progressive left, which had originally promoted multiculturalism. This shift is also, as Isabella Bakker has already pointed out, connected to other developments in which liberalism as an economic theory is seen to have failed by bringing about deeper divisions in society. These more deep-rooted political dynamics, along with the assumption that this constituted a major crisis of liberalism, were also connected to

the belief that enthusiasm for cultural diversity may have been overblown and even contributed to further divisions. Yet I think that the major reversal is that cultural conservatives have discovered the disintegrative dynamics they attributed to multiculturalism for their own political agenda. This is what I was trying to allude to when I spoke about the new discourse of cultural majority rights. And here we find a complete reversal of the idea of polyethnicity, post-ethnicity and hybridity. This also seems to play a certain role among the more radical left-wing currents that engage in cultural identity politics from the other side. These currents also reject hybridity as a concept, because they want people to think from epistemological perspectives that posit unalterable forms of identity of class, race or gender. In these cultural identity wars some important insights about earlier multicultural ideas embracing hybridity and poly-ethnicity have been lost. I am not optimistic that they can be retrieved in the current context.

WALDEMAR ZACHARASIEWICZ

If I may add perhaps an observation that has been resonating in lit-

erary studies. There is a claim that individuals who do not belong to a particular ethnic group should not be allowed to enter into the minds of other characters. As if a Canadian or a writer with a certain background could not present figures and explore the minds of newcomers to society. There have been calls for what is almost a kind of censorship, as if a writer were forbidden to explore the perceptions and feelings of individuals who are different, be they male or female, or other. This of course is an absolute contrast to what in literary studies has been regarded as the sign of genius. Think of Shakespeare, think of William Faulkner, think of Eudora Welty in the field of Southern Literature and writers, of course, also in the Canadian literary tradition who have shown their skills, their intense capability of applying what John Keats would refer to as a negative capability: the talent of managing to get into the skins – and thus have a sense of the problems, the experiences and the quality – of individuals who belong to a different class, or have a different ethnic and cultural background.

MARIA LÖSCHNIGG

I just want to connect to what you have said, because in literary studies the problem that is coming more and more to the fore is the whole appropriation of voice debate. It is increasingly problematic for a non-Native writer to adopt the voice of Indigenous characters, or for a 'white' Canadian author to write about other ethnic communities. This is a very sensitive and tricky question. On the one hand, I totally agree that this sort of censorship would without doubt reduce the aesthetic potential of literary or creative expression and would, moreover, deny the writer the possibility of trying to imagine being in another`s situation, etc. On the other hand, it must also be taken seriously that certain communities have the feeling that you are taking control of their stories and of their points of view. We were discussing this issue very vividly at a conference on Native Canadian literature and the positions were quite polarized and, as it seemed to me, incompatible.

GARY LIBBEN

In response to the question regarding the benefits of bilingualism, my own view is that, although many factors play a role, there are considerable advantages. Many of us, upon reflection, might remember that it was when we first encountered another language, that the idea that there was such a thing as a language became real for us. In other words, we came to realize that a language is a system, not just the way things always are and always have been.

RAINER BAUBÖCK

Concerning Gerald Stourzh's reflections on the importance of constitutionalism, I would like to ask him how he would reflect on the importance of different constitutional traditions in the US, in Canada and in Austria. From my perspective, I would summarize that the US as the oldest continuous democracy has a constitution that is almost unalterable and that is treated as a sacred document that can only be interpreted but no longer changed. In Canada, the constitution is much more a process. There is the Charter and the other elements, but the negotiations dealing with the claims of Quebec and Indigenous peoples, remain surprisingly unsettled and there seems to be some status where people accept that stability can be achieved without finally deciding some of the most crucial constitutional questions that are disputed. Another contrast is with the Austrian Kelsenian tradition where the constitution is an element of positive law that is supposed to function continuously, but that can be quite easily changed with a two-third parliamentary supermajority. In countries with similar constitutions, such as Hungary, this has raised the possibility that a government that is not a broad-based coalition but pursues an ideologically driven transformation of society may easily create a constitution that fits its own purposes if it wins the requisite majority. Considering that a task of the liberal constitution is to provide a normative glue in diverse and ideologically divided societies, it is amazing to see these very different constitutional traditions. I would like to ask Prof. Stourzh whether he thinks that one model might be better suited to cope with dynamic changes and diversity than another model.

GERALD STOURZH

There are considerable differences between rigid constitutions and flexible constitutions. That seems to be an important difference. The most rigid constitution in the world is certainly the United States Constitution. The way politics is discussed there has to do with the fact that amendments – as we all know – are extremely difficult and rare. In Austria and in most other countries, I would say, the flexibility is much greater. There are some special cases where a plebiscite of the whole population is necessary, like the decision of Austria to join the European Union, but this is very rare. Normal changes to the constitution can be made easily by parliament, and – what is less well known – constitutional articles are also inserted in normal laws. The constitution in a formal sense is much broader than the constitutional document. Constitutional elements are present in laws; they can be, and have been, changed very frequently. I am personally an advocate of flexible constitutions: it makes politics easier and, in a way, more democratic. The difficulties in the USA including with the composition of the Supreme Court are considerable and this has led within the last 30-40 years to a growing amount of scholarly literature criticizing constitutional jurisdiction, criticizing the increasing power of constitutional courts as compared to parliamentary institutions. I am not so pessimistic as some of these critics, because I do think that constitutional jurisdiction is part of our system of government, which does not consist only of democracy in the pure sense but also of participation of citizens. And constitutional jurisdictions are also important for the protection of citizens. I am greatly in favour of publicized dissenting opinions, which exist in most countries of the world: not in Austria, not in France, not in Italy, not in Belgium and Luxemburg, but in many other European countries, in the USA of course, in the English-speaking world. The idea and the possibility of dissenting opinions is an element of democratization. It makes the judicature and jurisprudence more democratic. It adds an additional element to the public discussion, to a democratic discussion; that is important.

WALDEMAR ZACHARASIEWICZ

I may just add a question from the audience: "As a cultural and literary historian I would like to know from the political scientist on the panel how strongly the implementation of multiculturalism in 1972 was motivated by the threat of Quebec's separatist endeavours? Moreover, how well does the concept of transculturalism describe contemporary social life in Canada, and what do you make of John Ralston Saul's notion of triangularity?"

ISABELLA BAKKER

I think, as I tried to suggest in my remarks, that the adoption of multiculturalism as a national policy was very much driven by the independent forces that were gaining political momentum in Quebec from the mid to the late 60s in particular and into the early 1970s. Hitched on to that were also demands from the Indigenous population for self-government, and the increasing number of immigrants coming into Canada from non-European countries: mainly India, China and the Caribbean. So, I think that all of those forces came together

around the time that the policy was actually formulated and it really has had a very powerful policy side, so it created a kind of path dependency, as economists say, where it locked together the idea of multiculturalism with the federal state and its provisioning functions. It also had a very strong impact in terms of the way in which Canadian identity was formulated and continues to be formulated, even if the reality does not necessarily meet the promise of the ideology.

WALDEMAR ZACHARASIEWICZ

Thank you very much. We very much hope that this is the beginning of a discussion and a debate to which academics on both sides of the Atlantic will contribute.

WALDEMAR ZACHARASIEWICZ *is Professor Emeritus of North American Studies at the University of Vienna and Doctor et Professor Honoris Causa of Eötvös Loránd University. His research focuses on transatlantic cultural exchange, on migration, travel literature, and imagology, the literature and culture of the American South and of Anglophone Canada. He is chair of the commission "The North Atlantic Triangle: Social and Cultural Exchange between Europe, the USA and Canada", a Full Member of the Division of Humanities of the Austrian Academy of Sciences and an International Fellow of the Royal Society of Canada.*

GERALD STOURZH *is Professor Emeritus of History. In 1951, he accepted the invitation of political scientist Hans J. Morgenthau to work as a research assistant at the Center for the Study of American Foreign Policy at the University of Chicago, where he stayed until 1958. The most important result of these years was his publication on Benjamin Franklin and American Foreign Policy (1954), for which he received the prize of the American Institute of Early American History and Culture. From 1963, he was Professor of Modern History at the Free University of Berlin and headed the section for American History at the John F. Kennedy-Institute for North American Studies. In 1969, Stourzh returned to the University of Vienna as Professor for Modern History until 1997.*

RAINER BAUBÖCK *is co-director of GLOBALCIT, an observatory on citizenship and suffrage at the Robert Schuman Centre for Advanced Studies at the European University Institute in Florence. He is a corresponding member of the OeAW and Chairman of the Commission for Migration and Integration Research.*

ISABELLA BAKKER *is Distinguished Research Professor of Political Science at York University. She is a leading authority in the fields of political economy, public finance, gender and development, and has been a visiting professor and Fulbright Scholar at various European and American universities.*

GARY LIBBEN *(PhD, McGill) is a Canadian psycholinguist and Professor of Applied Linguistics at Brock University, Director of the Words in the World SSHRC Partnership project, a Fellow of the Royal Society of Canada, and Corresponding Member of the Austrian Academy of Sciences. Gary Libben is co-founding editor of the journal "The Mental Lexicon", founding director of the University of Alberta's Centre for Comparative Psycholinguistics, and former President of the Canadian Linguistics Association.*

MARIA LÖSCHNIGG *is Associate Professor at the English Department of the University of Graz, Austria. Her research interests include Canadian studies, narratology with a focus on short fiction and epistolary writing, modern drama, and ecocriticism. Currently, Maria Löschnigg is preparing a book on the Canadian Short Story for the Routledge 'Introductions to Canadian Literature' series, to be published in 2022.*

PANEL 2

INTERDISCIPLINARY RESPONSES TO GLOBAL CHALLENGES

Chair:
Steven Cooke, RSC

Panelists:
Verena Winiwarter, OeAW
Alexia Fürnkranz-Prskawetz, OeAW
Gerhard J. Herndl, OeAW
Lauren Flynn, RSC

STEVEN COOKE

Global challenges such as addressing food insecurity, halting environmental change, alleviating poverty, and responding appropriately during the recent COVID-19 pandemic abound. These challenges are extremely complex and there is an urgent need both to understand their basis and to generate effective solutions that will be embraced by the masses for the benefit of humanity and our planet. On the surface, one might assume that food insecurity is a problem for agricultural professionals to solve or that medical researchers are the most relevant to addressing a pandemic. Yet, what is becoming increasingly apparent is that complex problems demand an interdisciplinary perspective and response. Inherent in global challenges is the complex intersection between economics, governance, science, technology, human behavior, health and well-being, and social justice. No one discipline or way of thinking will fully address inherently complex global challenges. In this session, we will consider the role of interdisciplinarity when developing responses to the global challenges of today and tomorrow. Key questions we will explore include:

What are the features of interdisciplinary perspectives that necessitate their application to addressing global challenges?
What can be done (think top down and bottom up) to better enable interdisciplinary efforts focused on global challenges?
When is an interdisciplinary approach counterproductive, if ever?
What do we need to do to ensure that the next generation of problem solvers have the skills necessary to engage in interdisciplinary scholarship and action?
My experiences as an environmental scientist have helped to shape my perspectives on interdisciplinarity and its value. For me, it has become the norm – an essential approach for understanding and solving environmental problems. When I reflect on how this came to be, it was organic and gradual – there was no moment when I consciously decided to be an interdisciplinarian. In some ways, the groundwork for this path was laid when I was an undergraduate student in a broad-based environment and resource studies program that was positioned at the interface of the natural and social sciences. It felt normal to read literature from different disciplines and consider diverse

perspectives during undergrad seminars, and that foundation stuck with me. I dug deeper into the natural sciences (ecology) during graduate studies, and it was only when I became a professor and was frustrated that the natural science I was doing was not having the impact I desired that I began to again reach out across the divide. It was out of necessity that I truly embraced interdisciplinarity, knowing that I needed to learn with and from engineers, social scientists, political scientists, economists, and legal scholars. My understanding and knowledge of ecology would only get me so far in my quest to solve environmental problems.
Over the years, I have spent time reflecting on what leads to success when engaging in interdisciplinary collaboration and teamwork. Here, I share a few thoughts:
• Mutual respect is essential – A key principle for success when engaging in interdisciplinarity is respect for others at the table. Recall, the whole idea is to bring together different knowledges and ideas and if there is not mutual respect, formative information will not be shared or acknowledged. Everyone must give in an interdisciplinary context and everyone must be valued. If

this does not occur, then relationships will falter and the benefits of interdisciplinarity will not be realized.

- Embrace different languages and cultures – Each discipline has its own language and culture. Embracing those differences and learning about them is important. Although finding a common language can be of value, that can also dilute ideas. It may be more transformational to take time to become sufficiently well versed in the other languages and cultures that one can interact with a given disciplinary expert in a meaningful way. This takes time but can lead to big dividends.
- Listen and learn – Effective interdisciplinary collaboration and teamwork demand exceptional listening skills and a willingness to learn. If one is closed-minded or a know-it-all, their days as an interdisciplinarian are numbered.
- Seek out other interdisciplinarians – The reality is that interdisciplinarity is as much an ethos as it is something that can be taught or learned. There are some who try and fail – while others succeed and become experts at navigating the space among and across disciplines. Seek out colleagues and build skilled teams that embrace and exude interdisciplinarity.

To conclude, there is still much need to explore how to operationalize interdisciplinarity and to understand its value and promise. Many institutions continue to pay lip service to interdisciplinarity (and related concepts) yet at the same time erect or maintain barriers to realizing its benefits. Moreover, there remain impediments to fully valuing and rewarding interdisciplinarity. Yet, to tackle the complex problems of today and tomorrow, we are desperate for interdisciplinary thinking and solutions. This session will hopefully advance this space and provide creative yet pragmatic ideas to help enable interdisciplinarity so that its benefits can be fully realized.

VERENA WINIWARTER

The Sweden-based Global Challenges Foundation identifies three global catastrophic risks: 'Climate Change', 'Weapons of Mass Destruction' and 'Ecological Collapse'. Two of the further risks they list – asteroid impacts and supervolcanic eruptions – are beyond human control, whereas artificial intelligence, solar geoengineering and pandemics result from interactions between societies and the material world, be they technological or natural. The World Economic Forum in Davos comes to similar conclusions. The Stockholm Resilience Centre has traced the "Great Acceleration" since the 1950s, when liquid fossil fuels became the dominant source of energy. The nuclear bombs dropped on Hiroshima and Nagasaki in 1945 changed the world profoundly and led to a still-ongoing discussion about the ethics of science. Since the 1970s, awareness has been growing of the limits of science and its role in the negative side-effects of progress. Landmark publications such as Barbara Ward and René Dubos' now all-but-forgotten 'Only One Earth: The Care and Maintenance of a Small Planet' (1972) and the still-famous 'Limits to Growth' by Donella and Dennis Meadows with Jørgen Randers and William Behrens, are cases in point. As then, scholars still need to acknowledge their limitations, but at the same time they face a growing threat from anti-scientism.

Societies have reacted to the growing list of challenges with new forms of organizations: first and foremost the IPCC, the Intergovernmental Panel on Climate Change, delivering data

for the UNFCCC, the United Nations Framework Convention on Climate Change. It came into effect in 1994, having been tabled, negotiated and signed by 154 states at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. The second such organization, IPBES, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, based on the United Nations Convention on Biological Diversity, was established in 2012. The mechanism in place foresees regular Conferences of Parties to achieve binding agreements. But international processes are wrought with difficulties, with compromises that render them ineffective and, above all, they take a very long time. Is there an upside? Yes, these processes are interdisciplinary by design.

From the earliest System Dynamics and Integrated Assessment Models onwards, developments in data acquisition (e.g. by remote sensing) and modelling have gone hand in hand. Geoinformatics and System Sciences, as well as a diverse bundle of Sustainability Studies, have developed as inter-disciplines. There is reason for hope, and for acknowledging the pioneers venturing into new areas and the universities and research institutions supporting them.

Meanwhile, indicators to measure output abound, with negative effects on interdisciplinary scholarship. Every employee's work at a research institution is measured, counted, labelled, benchmarked and archived for future promotion. Currencies for the system vary, from patent-application-praising to Journal Impact Factor to custom-made systems for measuring 'excellence'. By now, the science of evaluation has developed into a full-blown discipline with journals, chairs, and course programs.

Meanwhile, the Arctic ice is melting at an ever-faster pace. Extinction debt is increasingly feared. The IPBES defines this as 'The future extinction of species due to events in the past, owing to a time lag between an effect such as habitat destruction or climate change, and the subsequent disappearance of species.' Humanity is observing and participating in the 6th mass extinction in Earth's long history. Ecosystems such as coral reefs are destabilized, perhaps beyond their limits. Terms such as 'emerging ecosystems' try to capture the effect of the Great Acceleration on the living world since the 1950s. The recent pandemic is a result of human-animal interactions under ecological and economic pressures. Of the five new infectious diseases emerging every year, three are zoonotic, that is, of animal origin. According to a recently released special report by IPBES, pandemic risk is markedly increased by human-induced ecosystem disturbance and degradation.

The scholarly system is instrumental, in fact, irreplaceable and uniquely qualified to provide ways of coping in a humane way with the multiple and interlocking crises we face – and euphemistically call "challenges". But we must ask whether it is fit for that purpose. The question has to be reformulated for greater specificity: Is the current system of systematic knowledge generation ("scholarship") able to rise to the tasks of the present era, sometimes called "the Anthropocene"? There is a strong consensus that the solutions required are interdisciplinary. As I have argued elsewhere, "with funding agencies prescribing research projects to be carried out mainly by PhD students, interdisciplinary projects have to negotiate publication strategies in the context" of making PhDs fit for the job market, "while Principal Investigators (PIs) face recurrent team-building processes, having to

bring team after team up to speed rather than being able to build on previous experiences. PIs are often the only ones that can devote time to products that are considered less valuable by their universities and by the funding agencies. In Austria, PI time is usually written into projects as an 'in-kind' contribution, as they have a funded position. This allows a certain flexibility and gives room for a wider range of publications – even if over-commitment is a likely downside."

Now add the structural hostility any newly created, interdisciplinary endeavour is likely to face from already established units based on the (factually correct) fear of being deprived of funds diverted to the new organizations, and the inertia and disciplinary-bounded rationality of the system become more than apparent.

Academies of Sciences were originally created during challenging times as institutions for interdisciplinary and international exchange. They have delivered quite impressively on their promise, but the more they depend on money given by governments for short-sighted, but measurable goals rather than being allowed to draw freely on the knowledge and wisdom of their members, the less likely they can serve the goal of helping human-

ity to survive the human bottleneck that will likely follow the Great Acceleration. Drawing from all disciplines is imperative, in particular the humanities and social sciences, but it remans difficult, not least because of differently valued outputs.

Scientific freedom has always come with responsibility. We should not mistake it for an indicator-based accountability; acknowledging, of course, that careful and respectful, economical use of public funds is mandatory.

Academies of Sciences, their members, commissions, institutes and long-term initiatives are in a better position than most other institutions to become 'fit for purpose' in the current combined crises of 'Global Challenges'. They can deliver if they focus on what Australian-based interdisciplinary theorist and practitioner Gabriele Bammer suggests calling "Integration and Implementation Science" by seeing themselves as honest brokers and active communicators of curated knowledge (a notion coined by M. Karmasin).

The key components of such knowledge curation are self-awareness of the limits of science, humbleness, respect, trust and courage, a diversity of voices and a strong commitment to an ethics of knowledge. Knowledge itself will have to be interdisciplinary

by design and include co-creation of knowledge with non-scholarly actors.

ALEXIA FÜRNKRANZ-PRSKAWETZ

Recently, a colleague of mine (with whom I am involved in an interdisciplinary doctoral program on Water Resource Systems at TU Wien[1]) drew our attention to an excellent summary of the **challenges and problems of interdisciplinarity** published in Nature[2]. Let me quote from one of the authors (Rick Rylance) who nicely summarizes three arguments for interdisciplinary research:

"First, **complex modern problems** such as climate change and resource security are not amenable to single-discipline investigation; they often **require many types of expertise** across the biological, physical and social disciplines. Second, **discoveries** are said to be **more likely on the boundaries between fields**, where the latest techniques, perspectives and insights can reorient or increase knowledge. Third, these **encounters**

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[1] https://www.waterresources.at/

[2] https://www.nature.com/collections/jcfdb-ccgjj

with others benefit single disciplines, extending their horizons."[3]

As we also know, living interdisciplinarity (rather than merely multidisciplinary approaches – i.e., having disciplines work side by side) faces several institutional obstacles. These include the fact that promotion structures in science are still closely aligned with single disciplines, funding schemes are often not oriented towards interdisciplinary evaluation processes and, most importantly, appreciation for interdisciplinary scholars is often lacking.

Being myself an applied mathematician by training with a focus on population economics in my own research, I was fortunate to have had the chance to work in interdisciplinary research teams.

Let me briefly give you some insight from a recent report by the Leopoldina (of which I was part) on the **future of aging and life course research** in Germany[4]:

Aging for instance does not only have a biological explanation but is based on the continuous interaction between biology, individual decision making and lifestyle together with socio-cultural contexts. Research that lives up to the interdisciplinary nature of aging needs to consider a broad interdisciplinary spectrum covering molecular biology, medicine, behavioral sciences, economics, sociology, epidemiology, natural sciences and engineering sciences.

In our report, we highlighted that a pre-requisite of any interdisciplinary research is to also establish funding programs for such an interdisciplinary focus. Amongst other things, this also requires establishing interdisciplinary criteria and specific peer review processes.

We further highlighted that we need to allow more interdisciplinary training (having a common research question, but approaching it from different disciplines). Mutual prejudices should be minimized and the integration of methods and approaches across disciplines should be fostered. To allow for an interdisciplinary career, topic-centred sabbaticals, scholarships and trainings should be offered to foster knowledge in new disciplines.

As a second example of interdisciplinary research with a focus on interdisciplinary training, let me briefly draw your attention to the **doctoral program on Water Resource Systems at TU Wien**[5] that I mentioned at the beginning and of which I am proud to be part. We follow a multifaceted strategy in order to train and develop junior researchers in interdisciplinary research in water resource systems.

First and foremost, students are trained in a wide variety of methods from a broad selection of disciplines during their first year of PhD, including laboratory methods, mathematical models, tools from engineering, biology, chemistry and socioeconomics.

Students then work collaboratively on cross-disciplinary science questions structured into six clusters (modelling and system identification, risk and water resources, land surface processes, water resource management, water and health and hydrological open-air laboratory).

To foster interdisciplinary interactions and collaborations, students and faculty regularly meet, and various activities (yearly symposia, stay abroad, etc.) are organized.

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[3] Rylance, R. Grant giving: Global funders to focus on interdisciplinarity. Nature 525, 313–315 (2015), p. 313. Available under: https://doi.org/10.1038/525313a

[4] https://www.leopoldina.org/uploads/tx_leopublication/2020_Zukunftsreport_Langfassung_deutsch.pdf

[5] https://www.waterresources.at/

Doing cutting-edge research on exciting topics with excellent career options is clearly triggering the huge demand our doctoral program has generated so far.

Coming back to the global challenges mentioned in the introduction to the panel (climate change, biodiversity loss, global crisis of food systems), the recent COVID-19 pandemic has clearly highlighted our failure if we ignore interdisciplinary research and focus too much on adaptation and mitigation instead of prevention and sustainability. While the COVID-19 pandemic stimulates multidisciplinary approaches (medicine, epidemiology, mathematical modelling, social sciences, etc.) we need to invest even more in interdisciplinary approaches. Particularly at the current stage of the pandemic, behavioral science, psychology, political science, etc. – just to name a few – need to be integrated into measures of containment strategies and vaccination programs.

GERHARD J. HERNDL

The future of the global human population critically depends on whether we can create a sustainable economy based on renewable clean energy and not on further overexploitation of resources. Transforming our economy towards a circular economy should also lead to a north-south cohesion of living conditions, reducing the exploitation of resources in the global south. The required measures are summarized in the 17 sustainable developmental goals (SDGs) of the United Nations. These SDGs are ambitious and can only be reached if addressed in an interdisciplinary way, involving several scientific disciplines such as economics, social and natural sciences. The living conditions of the next generations will critically depend on what can be achieved within the next two to three decades to meet the SDGs. Interdisciplinary science will be indispensable to reach these ambitious, multifaceted goals.

LAUREN FLYNN

Globally, we are facing numerous challenges, ranging from the ongoing COVID-19 pandemic to climate change, that can only be addressed if we recognize the critical need to work together for the greater good. In addition to collaborating on an international scale, it is becoming increasingly clear that interdisciplinary approaches are required to address these complex issues. While science may offer solutions, unless careful consideration is given to the broad range of factors that can impact successful implementation, including technology transfer, scale-up, human behavior, cultural views, economics, ethics, government policy, and the media, these strategies will be doomed to fail.

From a personal perspective, as an undergraduate student enrolled in an interdisciplinary program in Engineering Science, I learned that many exiting advances occurred at the intersection between fields, when people from different disciplines came together and shared their knowledge and ideas to tackle issues. I chose this program because at the time it was the only option that would allow me to specialize in Biomedical Engineering, bringing together my passion for biology with my love of problem-solving and appreciation of the applied nature of engineering. However, this specialization did not occur until my third year, with the first two years providing a very broad foundation of courses across a range of science and engineering dis-

ciplines, in addition to philosophy, ethics and communications. This diverse and highly structured program forced me outside of my comfort zone and expanded my knowledge and experience much more than if I had been given free rein on my course selection, as I am sure I would have focused more exclusively on courses in my specific area of interest. While some may argue that this approach could result in a "Jack of all trades, master of none" situation, it challenged me to become a broader thinker, helped me to recognize my personal strengths and weaknesses, taught me about the unique language of different fields, opened my eyes to new technologies in different areas, and emphasized the huge opportunities that exist when people from different disciplines work collaboratively towards a common goal.

These early experiences shaped my personal philosophy that interdisciplinary approaches to biomedical research are essential to be able to develop new therapies that have the potential to be successfully translated from the bench to the bedside. As an academic, I am passionate about collaboration, and all of my ongoing projects involve working in teams with other groups that have diverse and complementary expertise. While most of my collaborations to date have involved other researchers in the sciences, engineering, or clinical medicine, I appreciate that as promising technologies advance, it would be essential to broaden this network to include experts in business, government regulations, manufacturing, human ethics, and public communications. Although my interests focus on health research, I am confident that the solutions to a diverse array of global challenges lie in meaningful interdisciplinary collaboration.

It is critical that we begin to think and discuss what is needed to train the next generation of problem solvers who will have to tackle these challenging issues. To be successful in interdisciplinary endeavours addressing complex global challenges, it is essential to be open-minded and a good listener, recognizing that effective collaboration is grounded in mutual respect and that each individual can bring unique and valuable perspectives. Focusing on personal goals and egos will be counterproductive – everyone has an important part to play. Notably, every discipline has its own language, and people need to learn to communicate with one another in meaningful ways. First-hand experience is key. Students need to be encouraged to expand their boundaries, think critically, and learn about topics beyond their area of study, and training programs need to give students in different disciplines the opportunity to work together on open-ended, challenging projects. A critical barrier to this is that university systems are typically siloed, with students rarely interacting with those outside of their own program.

Creative thinking, as well as investment of time and resources would be needed to support this type of new interdisciplinary, experiential learning, but the potential return on investment from a societal perspective should not be underestimated.

Ultimately, the acceleration of globalization mandates that we recognize how interconnected we all are, acknowledge the true complexity of the issues that we are facing, and embrace the exciting opportunity to let go of traditional views and accept the challenge of meaningful interdisciplinary collaboration.

DISCUSSION
STEVEN COOKE

The first question: In my introduction, I touched on the many global challenges that we face and local challenges as well. What I would like to ask the panelists is: Why do we need to go down an interdisciplinarity path, why do we cross boundaries of our comfortable little boxes, why do we engage in interdisciplinarity?

ALEXIA FÜRNKRANZ-PRSKAWETZ

When I started my research on the economics of aging, I got in touch with experts on the biological and sociodemographic processes of aging; otherwise I would not have been able to model the economic aspects of individual and population aging. Aging not only constitutes an important biological process, but it is extremely important to realize that it is also shaped by the interaction between individual decision making, your lifestyle and your sociocultural context. Ignoring these dynamics would yield an incomplete and, in the worst case, wrong understanding of the role of economic resources in aging and the implications of aging

for our economies. As my own experience has shown, by integrating the knowledge of various disciplines and applying it to the mechanisms of aging, we might better understand how to best utilize our ever-increasing lifespan. My own experience confirms the argument that many discoveries in the last years have taken place on the borders of different disciplines. Interdisciplinarity not only broadens one's own disciplinary spectrum, but it is becoming a prerequisite for advancing our understanding of complex phenomena.

LAUREN FLYNN

These global challenges we are talking about are inherently large and multifactorial. We need to realize how interconnected we all are on a global scale. When we just focus on what we, as single scientists, are working on, we will never be able to address major problems effectively. The COVID-19 pandemic highlights the complexity of such issues, along with the importance of interdisciplinary collaborations and recognizing that we are all part of an international community.

GERHARD HERNDL

There are, of course, different aspects, on a global scale or on a more local scale. I experienced this working in the Netherlands at an institute on a big island in the North Sea, where a high percentage of the people are fishermen. There is the problem of overfishing. The simplest solution to that would be to stop fishermen fishing and give them some unemployment benefit. You have a clear message from the biological and ecological perspective, but this is not an option due to socioeconomic aspects. So, it is not that easy to find solutions. You have to smoothly transform the society on that island. This is where we are now when we talk about global climate change. It needs transformative processes. For a long time, ecologists and meteorologists and others were measuring and monitoring and delivered clear evidence of climate changes, but now the interdisciplinary challenge is finding solutions. We have the data and we have numerous socioeconomic boundaries. This requires a lot of effort and a lot of communication between the disciplines. Currently, this is not done to the extent it should be. There should be more emphasis on the interdisciplinary aspect.

VERENA WINIWARTER

Three points on three different aspects: Let me start with the epistemological aspect. I think what we are talking about is problem-oriented science or scholarship. Why we feel so at home in our disciplines has to do with the fact that disciplines are, in fact, about disciplining one into a particular methodological bucket. The only problems that you can see when you look outside are the ones that fit into your bucket. The methods that you apply will make you construct problems in such a way that you can tackle them with your methods. That is why they do not have much to do with what is outside. Only by the constant irritation of your own view by people in their other buckets, together you will be able to look at the space in between. Of course, it is cosier to stay in your little bucket than to reach out into the irritating water outside.

The second question translates into the Social Studies of Science realm. Here I am picking up Alexia's point. Innovation within the scholarly realm has always depended on crossing boundaries. And therefore, it cannot happen in the middle of the most secure knowledge. It always happens on the margins. The best way to stay on the margins is to constantly cross the boundaries to other disciplines. This is extremely productive, and it should feature much more in our master programs and PhD training. When I am asked if we are doing an acceptably good job in preparing students, my answer is no, we are not. I think you need two skills; this has been called the T-competence model. You have your disciplinary in-depth competence that you need as the vertical part, and communication competences as the top bar of the "T" that enable you to reach out of your bucket. We are good in the first part, but very bad in the latter. Those soft skills, as they are called, are in fact very hard skills – hard to acquire, and just as important as the other skills.

We do not just deal with complexity, we deal with what have been called wicked and super-wicked problems, which are emerging properties that nobody has been expecting. In order to be prepared for those kinds of surprises, being surprised by your own colleagues across the boundaries of disciplines is probably the best training you can get. As an example: I am working on wicked legacies. A legacy is a spot of extreme toxicity in the ground resulting from long-lasting activities. The difference between a wicked legacy and a monster legacy is not a technical question. It is not the toxicity; the main issue is corruption. In a corrupt or failed state, it is much more difficult to deal with a legacy of the same toxicity than in a state with good governance. Without interdisciplinarity, you would not be able to see this aspect.

STEVEN COOKE

There is a question from the audience: "Global systems are extremely complex. How can we manage to combine a necessary technical debt with the equally necessary interdisciplinary overview within the framework of our research? Can you provide any practical examples?"

LAUREN FLYNN

For me, one of the most important things is the importance of collaboration. We need to bring together multiple people so that there is the technical depth that is required to solve these major challenges, and we also need to learn how to talk to one another effectively. That is one of the

things I have learned from my experiences – that we all talk a slightly different language, and we do not necessarily even realize it at times. Learning who we can reach out to and who is open to collaborating on interdisciplinary problems. I think it is extremely important to recognise that everyone on the team is important and that no one overrides one another. It is only through experience that we gain knowledge of how to talk to one another and how to work together effectively. Universities need to give people the opportunity to learn how to talk to one another, how to learn about different fields and appreciate their values.

ALEXIA FÜRNKRANZ-PRSKAWETZ

One example is the Doctoral Programme on Water Resource Systems at TU Wien. An important premise is to be open-minded towards other disciplines. In this doctoral school, we train our students in various fields including engineering, social sciences, etc. We are trying to bring people to the same level of interdisciplinary knowledge. But let me also stress, not everyone will be a specialist in each field. This is very impor-

tant. So, we also aim to capitalize on and strengthen the comparative advantage of every single person and her disciplinary background. The ultimate aim is that PhD students also start collaborations within the program across disciplines but with a common research agenda. Such a common research goal is key of any successful interdisciplinary collaboration.

STEVEN COOKE

There are many barriers at various levels to actually engaging in interdisciplinary research and scholarship and bringing such a process to bear on the problems of today. There we are going to go next. What are the barriers? What are some of the strategies for overcoming those barriers?

GERHARD HERNDL

One of those barriers, at least in Austria – not so much in other European countries – is that there is not much funding available on the governmental side. There are some possibilities, like teaming up with companies, or on an international level, of course.

For example, I am involved in a Marine Plastic Initiative working together with the Ocean Cleanup Initiative funded by a young Dutch entrepreneur. There are possibilities, but these possibilities are limited for doing research. From the funding side, there is more to do here on a national level. On the European Union level the Horizon 2020 Programme allows quite some room for interdisciplinary research, but for my taste there is so much bureaucracy involved that it is not very attractive. From the national funding agencies there are limited resources available for interdisciplinary research. So, there is a lack of funding possibilities.

VERENA WINIWARTER

One of the great things about the European Research Council is the synergy grants. I was involved in a mock interview for a team with a synergy grant. The main question for reviewers is: What is the difference between you each getting your own projects and you all doing something together? And if you can not answer this question, then you will not get the synergy grant. That is real money, several million euros. The European

Union, at least the European Research Council, has clearly understood the message. But yes, I think that funding is a barrier. But another question is, do we sufficiently prepare people? I think this is another barrier. The barrier is that training is disciplinary in origin, and there are, for example, structural differences between university departments. They sort of prolong this situation into the future. I have been supervising a handful of interdisciplinary PhDs. These young people really suffer from too many decisions to be made. "Do I publish in that humanities-based journal, where they want me to use footnotes, and they want me to start with an example, and there have to be people in there?" The same stuff, for example about how people and rivers interact, could be placed in a river journal, but there, editors will say that the paper is not really systemic and not enough data-based. Those poor PhD students, how can they carve out a career in such a messy space? Students do not know how to create an interdisciplinary narrative. They can write an "introduction, methods and materials, results and discussion" article, the normal way you publish in Nature, but there is not even a methods' section, for example, in the

Journal of Interdisciplinary History. I think there are a lot of structural barriers when young people set out to enter interdisciplinary fields. Also, the impact points of these journals, on which the quality of papers is judged – which is wrong in my opinion – makes the life of interdisciplinarians much more difficult.

LAUREN FLYNN

We need to develop better frameworks for assessing interdisciplinary projects. Another barrier is time. As academics we have many hats to wear, which can be very challenging. I am very passionate about research, but I have many other important responsibilities including teaching. Having dedicated time for research is extremely important. Otherwise, progress is going to stagnate. Another potential barrier is how individuals are assessed within the academic system. When I started out as a faculty member, I was told that I would not get the same credit for collaborative work as for studies that were completed under my sole supervision. There needs to be a better system that supports collaborative research. Just because you are an early-career

investigator does not mean that you could not be leading an interdisciplinary effort.

ALEXIA FÜRNKRANZ-PRSKAWETZ

Almost everything has been said. Definitely, the promotion structure at our universities is one of the limiting factors that hinders interdisciplinarity and needs to be changed; however, this will take time. There are several options we can choose in the meantime. One option is to give young people time, let them be exposed to interdisciplinary work, provide them with the opportunity to take sabbaticals, connect them to centres where interdisciplinary work is being done. My impression is that there are increasing numbers of calls for research proposals that require interdisciplinarity, but the rejection rate is often quite high in such calls. One reason might be that we are not yet well trained to evaluate interdisciplinary projects. Let me also mention that we need to increase our appreciation for people doing interdisciplinary work. Though there are a few colleagues that enjoy a high reputation for interdisciplinary work and are publishing in high-level journals,

I would still argue that many young scholars that aim to step into interdisciplinary research have difficulties being accepted in their own scientific field. We have to start breaking up these borders and enable interdisciplinary work also to be published in high-ranking subject-specific journals, and again, we can only succeed in this endeavor by cultivating interdisciplinary evaluation processes.

GERHARD HERNDL

There was an initiative from a Dutch science foundation to ring-fence money for interdisciplinary research on the North Sea. We wrote proposals from different fields and then we got the evaluation back; and it was sort of funny, because one review said that this part was completely incomprehensible, and the other review said that it was the most innovative part of the proposal. So reviewers also need to be trained. One thing which gives hope is that it is becoming more and more common to team up with economists and biologists, for example, when it comes to fishery. There is a tendency that we are becoming aware of the necessity, and we also do not need large research

grants to do this. It is also up to us to be open-minded, aware and ready to address problems and to interact with each other. Reluctant funding agencies are only one side of the coin.

VERENA WINIWARTER

Several things make me hopeful. I have been involved in the advisory board of a currently running, and soon to be finished, EU project called "Shape ID" (Shaping interdisciplinarity); several policy papers are already published. Shape ID has a fabulous website for people who have had no experience yet with interdisciplinarity. It is a huge literature review, but it is thematically organised. It helps people navigate. A colleague of mine in Australia, Gabriele Bammer, has put together a wonderful blog on interdisciplinarity where people write about their experiences. There is no venue to share the crucial project design questions. Whether a project will work or not depends on how you envisage the internal cooperation process and how you bring external people in. Gabriele Bammer calls it "integration and implementation science". And I think it is smart not to call it interdisciplinary, because it

does not link back to disciplinarity. We can all learn from one another and listen to experienced interdisciplinarians; but we do not have to reinvent the wheel all the time.

STEVEN COOKE

We have another question/comment that came in from the audience: "The challenges are not just complex, but require urgent action." How do universities, academies, scholars respond to these urgencies and contribute to solutions and actions that recognize the issues? Lauren, for example, stated that it takes time to do this kind of work. How do we navigate that space? How do we reach solutions quickly in this space? Any thoughts?

GERHARD HERNDL

There are differences; for example, some universities are still organised in a monodisciplinary approach. You have plain science, you have zoology, chemistry and so on. In Central Europe, it is more difficult to change department structures than it is elsewhere. In the Netherlands they re-

spond much faster to developments. What we should envision, and what we should strive for, is to bring researchers from different fields together in a single department. This is important just to have those interactions where you get out of your office for coffee and a chat, and it is more stimulating.

ALEXIA FÜRNKRANZ-PRSKAWETZ

The COVID-19 crisis has taught us clearly that scientific knowledge is in demand and we need to communicate our research continuously. Hence, a continuous interaction with stakeholders is important. Our task as scientists is not to advise on policy, but to inform policy and more broadly the public about our evidence-based research findings. With respect to climate change and other global challenges, we need to better understand what incentives we need to establish that will succeed in changing human attitudes, behavior, perception etc. These changes cannot be expected to happen within short time periods, but require a long-term perspective. At the same time, we also need to develop technologies and other measures that allow adaptation and mitigation of human behavior. In many sciences where human behavior is involved, such a two-way consideration is required.

VERENA WINIWARTER

The solution to rapid response is large teams. Akatech, the German Technical Academy, and the Leopoldina, the German Academy of Sciences, have shown that by drawing on their huge pool of excellent people from all walks of scholarship, they have been able to put out reports on EG food security as impacted by COVID-19 within weeks. This is the way to go. If it is urgent, then assemble a large team, include a few people who can act as "translators" between disciplines and who have experience in leading large interdisciplinary teams, and let them work; they will answer those urgent questions. But if you want implementation, do not talk down to the public. This is what I think I also got from Alexia. All of us have to respect the people who have no academic training. They have to have a say, if any of our knowledge is ever to be implemented.

STEVEN COOKE

A great showdown for respecting and embracing different ways of knowing. We are going to move along, and our next question is: When is an interdisciplinary approach counterproductive, if ever? Just because one can do interdisciplinarity, is it always the right tool or right approach for the job?

LAUREN FLYNN

One of the things that came to my mind is the importance of supporting independent investigator-led fundamental research. It is critical to have a foundation of knowledge to build on when developing interdisciplinary projects. Sometimes it is not that interdisciplinary research is counterproductive, it is just not ready for that stage yet. We do not want to move to a model where funding is only for interdisciplinary projects or where there are always top down directives on what is going to get funded, because we need to develop knowledge and tools that will help prepare us for the next set of problems. We do not want to be reactionary. We want to nurture the broader scientific community.

STEVEN COOKE

I would love to hear a story of where there has also been a failure in this space. Has anybody a good story about that?

GERHARD HERNDL

We have a curriculum that is more interdisciplinary. So, there are master's students coming in from different fields and the problem we are facing is that some have more training in chemistry but nothing at all in biology or they are coming from geology and do not know anything about another field. It is difficult to get them on the same level. They know a bit from everywhere, but it does not work to the extent we would have wished. They all have a bachelor's degree in a different area, then you bring them together; you cannot expect to get them to the same level within one semester. I think we need students to have a solid base in one area and, once they have this, they can open up to related fields. I think you have to be specialized in one field first. Once you have that, you can open up and gain more of a bird's eye view of the problems.

VERENA WINIWARTER

I recently reviewed a paper; I am not going to say anything about it so as not to violate any rules, but it had to do with history of ideas in a transcultural context. It was extremely superficial, only used secondary literature and no sources, no material from the different cultures. The author was only reading in one language and was using secondary information, which does not qualify as original scholarship. The paper was branded as interdisciplinary because it was about a natural science question from the viewpoint of cultural anthropology. Interdisciplinary becomes counterproductive if it is not taken seriously. Unfortunately, such papers are published, and this is counterproductive for all who seriously frame their questions in an interdisciplinary way.

ALEXIA FÜRNKRANZ-PRSKAWETZ

That was one of my main points. I would never simply expect interdisciplinarity from the onset. I would let it be determined by the question we are interested in and the scale of the problem. When I talk about scale, I have in mind that we need to distinguish between the local versus global level and also between a dynamic versus static process. When the COVID-19 crisis began last year, the most immediate question was understanding the evolution of the epidemic. At the beginning, epidemiologists, medical experts, but also simulation experts were trying to understand the dynamics of the new virus. In the course of the epidemic, it also became clear that experts in behavioral science needed to get involved in order to understand how we could incentivize people to accept the non-pharmaceutical measures that were being implemented. This interdisciplinarity would not have been productive if it had been implemented at the onset of the pandemic; further studies could only be carried out once the necessary information was available. At the start of the pandemic, we needed to react quickly. There was not enough time and not enough available knowledge to make interdisciplinary approaches feasible. To begin with, we could not even predict which disciplines were needed in order to understand the evolution of the pandemic and its interaction with the prevailing socio-economic characteristics of different societies, and the institutional limits of the

various health systems. Hence, interdisciplinarity approaches depend on the evolution of the problem at hand. COVID-19 is obviously a very good example. I would argue that at the current stage of the Covid-19 pandemic, we need psychological and behavioral sciences much more than we did in the beginning.

STEVEN COOKE

The last structured question that I have is: "What do we need to do to ensure that the next generation of problem solvers have this necessary skill to engage in interdisciplinary scholarship and actually move some of these problems forward, help to solve them?"

LAUREN FLYNN

Within the university structure, there is a tendency to work within your department or faculty. Even within a faculty, there may be little interaction with people outside of your program. You can not undersell the value of experience. So, we need to start thinking bigger about how we can foster an environment where students from

different disciplines can come together and tackle large open-ended problems, starting in undergrad. Often, students have limited opportunities to tackle problems where there is more than one answer or potentially no "correct" answer. We need to give them more of these problems to tackle and give them the opportunity to work with students outside of their area, for example bringing together students in engineering with those in science, the social sciences and business. I think the challenge is how to do this effectively. Resources and new methods of assessment will be required. Developing those structures will be challenging but would pay off substantially in terms of broadening the learning experiences for the students and preparing them to tackle major interdisciplinary challenges when they advance in their careers.

GERHARD HERNDL

What we could do for the next generation is to look at a specific problem from a different angle. To give you an example, when we discuss producing organically grown food using less pesticides, it might be that we need

more technique, not less. For example, using greenhouses instead of fields. We are still doing agriculture more or less as we did 2000 years ago, except with a lot of fertilizers. But we have greenhouse technology that would enable us to harvest, say three times a year and not just once. This would save a lot of space and leave it for nature. So this means combining biological questions with technology. The same applies when we talk about sustainability. We are discussing reducing the Carbon footprint from a solely negative perspective: you should not fly, you should not do this, you should not do that. We do not focus on how aspects of this might increase our quality of life. This might stimulate the next generation to think about finding new solutions.

VERENA WINIWARTER

In sustainability research we are in the age of post-normal science, where the urgency is great, the stakes are high and there is little social consensus on either the problem or the measures required. Which means that we have yet to come up with curricula that teach post-normal sci-

entists. I am teaching on a master's program called "ETIA" (Environment, Technology and International Affairs). It is great because it actually bridges the gaps. Every university should implement four learning goals towards interdisciplinarity in curricula: patience, courage, trust and humility.

STEVEN COOKE

I want to go around the room and ask each of our panelists for one word that to them describes what interdisciplinarity is or why they do it. I will go first, just to model this. The word that I am going to use is "learning". The reason I chose that word is because these problems require that we come together and learn together, and I think that actually connects to the humility that Verena just mentioned. We do not know it all. There is no one person that can tackle this alone and you have to be open to learning. In my experience, the people that engage in interdisciplinary scholarship are those that truly embrace that concept of lifelong learning, no matter if you have one PhD or three PhDs. You are still up to learn more.

VERENA WINIWARTER

The word is "open-mindedness" and I do not think that it needs an explanation.

LAUREN FLYNN

I would say "collaboration" and that ties in with both learning and open-mindedness.

ALEXIA FÜRNKRANZ-PRSKAWETZ

In fact, I had the same word as you, Steven, and it is "learning". Let me just add something: learning not only with but also from others. I think that is important.

GERHARD HERNDL

I would pick seeing a problem from a different angle, and also finding solutions which I would not be able to do alone.

STEVEN J. COOKE *is Professor of Environmental and Interdisciplinary Sciences at Carleton University (Ottawa, Canada) where he studies aquatic conservation and management. His work spans the natural and social sciences with a focus on developing solutions to complex environmental problems. Cooke is Director of the Canadian Centre for Evidence-Based Conservation, Secretary of the College of the Royal Society of Canada, a Fellow of the Explorers Club, and a Fellow of the Royal Canadian Geographical Society.*

VERENA WINIWARTER *is Professor of Environmental History and Head of the ZUG, the Centre for Environmental History at the Institute of Social Ecology, University of Natural Resources and Life Sciences, Vienna, Austria, Past President of the International Consortium of Environmental History Organizations (ICEHO), Chairperson of the Commission for Interdisciplinary Ecological Studies, Austrian Academy of Sciences, with expertise in environmental history, in particular rivers, soils and legacy pollution.*

ALEXIA FÜRNKRANZ-PRSKAWETZ *is Professor of Mathematical Economics at the TU Wien, Vienna University of Technology (Institute of Statistics and Mathematical Methods in Economics) with expertise in population economics, and Deputy Director of the Vienna Institute of Demography of the Austrian Academy of Sciences. She is also one of the Directors of the Wittgenstein Centre of Demography and Global Human Capital and Research Associate at IIASA, Laxenburg. She previously worked at the Max Planck Institute for Demographic Research in Rostock and had extended stays at the University of Chicago and at the University of California, Berkeley.*

GERHARD J. HERNDL *is Professor of Aquatic Biology at the University of Vienna. His research focuses on marine biogeochemistry and biological oceanography. He is an Elected Member of the Austrian Academy of Sciences and received the Wittgenstein Prize in 2011, the highest scientific award of Austria.*

LAUREN FLYNN *is Professor in the Departments of Chemical & Biochemical Engineering and Anatomy & Cell Biology at The University of Western Ontario, focusing on the development of cell-based regenerative therapies for applications in soft connective tissue regeneration, wound healing, and therapeutic angiogenesis. Her interdisciplinary and translational research program involves collaborations with engineers, biologists, imaging scientists, and clinicians, and is funded by the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and Heart and Stroke Foundation of Canada.*

PANEL 3
COPING WITH THE COVID-19 CRISIS

Chair:
Sylvia Knapp, OeAW

Panelists:
Tom Marrie, RSC
Darren Gilmour, RSC
Astrid Mager, OeAW
Josef Zechner, OeAW

SYLVIA KNAPP

The societal, scientific, political and economic impacts of the ongoing SARS-CoV-2 pandemic are tremendous, with no end in sight, and require substantial adaptations on our part – as a society and on multiple levels. The immediate response was centered on medical needs and resulted in a shutdown to slow the spread of SARS-CoV-2 and prevent the collapse of the health-care system. While the epidemiologic reasoning of these restrictions of personal freedom seemed justified, the implications this reaction has on the society at large are still unclear.

I want to discuss with the panel and the audience questions related to the societal, political and economic repercussions, focusing on the following broad topics:

- How can we find a better balance between citizen rights and citizen health in pandemics in the future?
- How can we prevent the marginalization and potential discrimination of certain societal groups, and how can we ensure the involvement of more – diverse – stakeholders: the elderly, women, less privileged citizens?

- Do technological advancements and tracking apps fulfill their promise? How should we deal with internet myths? Will COVID-19 become a catalyst for a more resilient economy?
- What is the potential and what are the limits of monetary and fiscal programs to cope with COVID-19?
- How can we enhance communication, outreach and engagement beyond the academy during such crises?

I am now very honored to welcome our distinguished Canadian guests Tom Marrie and Darren Gilmour and ask them about their connection with COVID-19.

TOM MARRIE

Thank you very much, Sylvia. We are grateful to you for inviting us to this Joint Academy Day. I am very fortunate to be leading a team of a talented group of individuals from the Royal Society of Canada (RSC) and other academics outside the Royal Society throughout Canada who have examined many of the questions that you have posed to us. I will be reflecting on those, and I look forward to a great afternoon and learning from you all.

DARREN GILMOUR

Firstly, I would also like to thank the organizers for bringing us here together today and for this opportunity to exchange our ideas. My job as the Executive Director of the Royal Society of Canada has been to work in support of the RSC taskforce on COVID-19 chaired by Tom Marrie that is now almost exactly one year old and has had, we think, an impact that I would like to share with you.

When the pandemic arrived on Canadian shores it was clear that there would be the need for enhanced engagement from researchers across all disciplines. The President and the Board of Directors of the Royal Society of Canada decided in March 2020 that the membership of the RSC ought to do what they could to ensure that Canada emerges as a better society coming out of the COVID-19 pandemic than it was going into it. A taskforce was established, and now over 400 experts, scientists, scholars and artists from 68 universities are engaged in preparing publications to ensure that Canadians have access to independent, evidence-based science. We established to date two lines of work. We began organzing groups through the taskforce that would

produce Policy Briefings, which are documents that are established to produce an evidence base with recommendations, which is then peer reviewed. At the same time, we established a track of shorter pieces of that style which we called Informed Perspectives. We did that in partnership with The Globe and Mail, which was key in order to move "in real time" in this important work. Over 130 Informed Perspectives and 13 (plus 10 in production) Policy Briefings covering a quite extraordinary diversity of themes have been released so far. The first issue that the taskforce thought to confront was the situation in long-term care homes in Canada, which was at the beginning – and continues to be – an area of major concern.

I have to point out that the different working groups are entirely volunteer-driven and member-driven efforts. In summary, the work of the last year has illustrated to what extent the Canadian scholarly research, scientific and artistic communities are passionate about contributing to and working for a better future for this country. Our own efforts on the more administrative side have been to ensure that all of these resources are publicly available.

SYLVIA KNAPP

Speaking as a scientist myself, probably the most remarkable or impressive event over the last year of this pandemic crisis is the incredible speed of discoveries and publications. But this avalanche of information overflow is also reflected in the Internet. There are tons of blogs, tons of articles, tons of tweets and so on dealing with COVID-19. And of course, this also creates some confusion, because not everything is as well explained. We will come back to these internet myths and fake news a little later. One term that popped up constantly since the COVID-19 crisis started is digitalization. Digitalization will help us, but at the same time, we encountered a lot of limitations and problems in this digitalized world, and I would like to invite Astrid Mager to talk about this.

ASTRID MAGER

In my statement, I will particularly address two of the questions guiding this panel discussion, both related to the digital transformations we are witnessing in these days. Let me start with the first one:

Do technological advancements and tracking apps fulfill their promise? How should we deal with internet myths?
The short answer to the first part of this question is no, at least not in Western democracies. While East Asian countries successfully used digital mobile tracking to "flatten the curve" – mainly on a quasi-mandatory basis, like in China, but also sometimes voluntarily, like in South Korea – European countries apparently had their problems with motivating citizens to download their contact tracing apps. But why is that?
Let us have a look at the Austrian situation: In Austria, the "Stopp Corona App" was developed by the humanitarian NGO "Austrian Red Cross" on behalf of the Ministry of Health. The app was thus neither owned by a for-profit company, nor by the government itself, which might ideally have instilled citizens' trust in the app. Technically, the app was developed in a decentralized, privacy-friendly way based on Bluetooth technology enabling the "digital handshake". The app was audited by two digital rights NGOs and a research institute, and its code was made open source right after their positive report came out. This auditing work was performed voluntarily

without getting any funding for it, showing that professional bodies of expertise, that would be able to accompany the development and implementation of new digital technologies and tools, are lacking.

Apart from that, many things were done right in the development of the app: The app used privacy-friendly technical standards, and civil society stakeholders were involved to guarantee a transparent process. As one of the first countries with its app ready for digital contact tracing, Austria even figured as a best-practice case in the European Union at first. And still not enough citizens downloaded the app, making it useless in practice. One reason for this lies in the political narrative accompanying the introduction of the app. Right after the app was ready, a conservative politician – almost randomly – proposed in an interview to make the COVID-19 app mandatory. Even though the app was – and still is – intended to be used voluntarily, its image has been badly damaged. The Austrian minister for health tried to reanimate the app several times, but it never recovered from its poor image and most likely never will. This shows that tech development and political regimes are closely interrelated. It further shows

that narratives and myths surrounding a technology are crucial for its implementation and use. One central aspect in public debates around the app was the privacy aspect. It can be seen as a sign of a healthy democratic system that fundamental rights are still raised in times of a global health crisis, but it is still remarkable given the fact that most citizens use social media platforms and messenger services provided by US-American tech companies on a daily – if not hourly – basis. Moreover, the European Union has been dreaming of "digital Europe" for some time now, but digital coping with COVID-19 happened in a rather nationalistic, fragmented and shortsighted fashion. Contact tracing apps are a very good example of this since each European country developed its own app, quickly posing challenges for international travel. We can thus learn a number of things from this case: 1) The technology is only as good as the political narrative and the myths accompanying its implementation. 2) We need new institutions, guidelines and governance bodies with enough financial resources and technical know-how to professionally audit and evaluate new apps and algorithmic systems; especially those increasingly provid-

ed by governmental and public institutions. 3) And these could (should) most probably be harmonized on a European level in order to be able to act in a more coordinated and integrated way contributing to more transparent, just and sustainable digital technologies and practices in the future.

The second question, partly related to the first one, is:

How can we enhance communication, outreach and engagement beyond the academy during such crises?

While the pandemic spread around the globe, scientific controversies increasingly unfolded in media, policy and, most importantly, in social media spaces of various kinds. Debates quickly emerged over the data used for computational modelling, the kind of "evidence" these simulations create, and what numbers would legitimize policy measures severely curtailing fundamental rights, such as lockdowns of entire populations. In these discourses, mathematicians and epidemiologists advanced as new science popstars, speaking to the public via podcasts and (social) media – just think of the virologist Christian Drosten in the German-speaking world, for example. At the same time, pseudo-scientific

accounts and self-proclaimed experts also came on stage. Accordingly, an accelerating multiplication and proliferation of knowledge and expertise can be observed fueling debates about fake news, conspiracy theories and post-truth. This phenomenon is not entirely new, as internet research has shown for some time now, but we can see it speeding up in times of crisis when knowledge becomes a matter of life and death. Contrary to past times, when scientific outreach often seemed to be hard to accomplish, we can witness almost the opposite these days.

Computer modelers, epidemiologists, virologists, public health experts and the like have become crucial policy advisers both as part of formal COVID-19 taskforces, but also as part of media and social media debates providing a new kind of "mediated policy advice". Some of this advice overlaps with formal policy advice, some of it stays separate, and some of it transforms on its way through social media platforms in the form of postings, comments, and retweets. I would thus argue that scientific knowledge has left the academy pretty easily and quickly in the current time of crisis, but that its abundance, heterogeneity and messy

character makes it hard to digest for citizens facing existential problems. The downside of this evidence-based policy-making can thus be seen in the spilling over of scientific controversies – over the effectiveness of masks or school closures, for example – into the public domain. In fact, scientific knowledge itself becomes preliminary and transformative in times of crisis when uncertainties and non-knowledge prevail. Due to the high pressure to act, newly produced "evidence" such as computer simulations of the spread of the disease have become a sort of anchor to hold on to if we think of all the numbers and curves presented in the evening news. And the speed of producing knowledge has accelerated not only in the fields of medicine, mathematics and public health, but also affects the social sciences and humanities. All of a sudden, every institution had something to say about the crisis – from whatever disciplinary angle – and the emergence of fast-track funding opportunities for COVID-19 research further accelerated this phenomenon. Again, there are a number of lessons to take away from this: 1) Knowledge, expertise and experts proliferate in times of crisis, posing new challenges for classical science communication. 2) At the same time,

academic practices and modes of publication are speeding up, posing new questions in terms of quality measures and credibility within the academy as well. 3) So, how can we keep up with these speedy conditions in our own research and science communication without losing credibility, both within and beyond the academy?

TOM MARRIE

While the RSC Task Force on COVID-19 has not studied tracking apps, we produced a Policy Briefing led by Timothy Caulfield called "Let's Do Better: Public Representations of COVID-19 Science". Among its findings are:

"COVID-19 science is being both done and disseminated at a furious pace. Currently, the median time from the submission of an article to acceptance is just six days.[1] That is an astonishing increase in pace of acceptance from the pre-pandemic speed of around 100 days. And some publications made it through peer-re-

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[1]   Palayew A, Norgaard O, Safreed-Harmon K, et al. 2020. Pandemic publishing poses a new COVID-19 challenge. Nature Human Behaviour, 4(7): 666–669. DOI: 10.1038/s41562-020-0911-0.

view in just one day."[2] This has led in part to a number of retractions including from prestigious journals. The hydroxychloroquine story is a well-known example of this. The problem with misinformation is: It leads to an erosion of public trust in science which leads to an increased belief in COVID-19 myths and conspiracy theories. Note that more than 200,000 coronavirus-related journal articles had been published by December 2020.

The spread of health misinformation often has an ideological dimension. Thus, raw milk is often framed as about choice and food freedom, and this approach resonates more with the public than the scientific reasons for pasteurizing milk put forward by public health authorities.

Kelly Greenhill, Professor of Political Science at Tufts University, indicates there are 6 social trends that explain this era of misinformation:

1. High levels of anxiety
2. Low levels of trust
3. Polarizing discourse

2   Locher C, Moher D, Cristea I, Florian N. 2020. Publication by association: the Covid-19 pandemic reveals relationships between authors and editors. MetaArXiv [preprint]. DOI: 10.31222/osf.io/64u3s

4. Disruptive communication technologies (internet and social media platforms)
5. Rise of new gatekeepers – social media platforms have algorithms tailored to the individual to create echo chambers that are molded to their pre-existing universe and perceptions
6. The presence of many actors willing to create bunk, hype and fear

What can be done about it?

#ScienceUpFirst is a social media movement developed by a team of independent scientists, health care providers and science communicators to stop the spread of misinformation around COVID-19. Within two months of establishing this platform there have been 65,000,000 impressions (people seeing stuff on social media). 6,500 new users (new people spreading the word) and 1,600 experts (clinicians, academic, public health officials) have joined the team (volunteered to assess content, etc).

DARREN GILMOUR

That is a really interesting point around communicating science, communication, and in particular, communicating uncertainty. I will just

point our viewers to another piece by Timothy Caulfield that he released last week called "COVID-19. Science and the Uncertainty Dance". It is available on our website, as well as that of the Globe and Mail. And all of these various underlying pieces are hyperlinked to the research, which is a fascinating and wonderful component of this partnership we have with the Globe and Mail. Dr. Caulfield's preliminary conclusions are that to date, in the Canadian context, it appears that community being clear that the science is uncertain enhances perceived credibility. So, this is good news to the extent that scientists and journalists are encouraged to state when there is uncertainty and that that actually seems to have a positive benefit in terms of how readers and citizens trust in journalists and scientists because they are being upfront with them.

SYLVIA KNAPP

The communication issue is a big one. But another aspect, of course, is the economic impact of this COVID-19 crisis. And I want to move on to Josef Zechner's expertise. Thinking about what the limits are and the potential

of a monetary and financial program to cope with it. This is an important aspect, not just now but probably later, too. Maybe you can share your thoughts on this.

JOSEF ZECHNER

I think we have all seen the devastating effect of the repeated lockdowns on economic growth. And, in preparation for this discussion, I just looked at the recent GDP numbers for 2020. Global GDP has dropped by almost four and a half percent. The drop has been much more dramatic than during the Global Financial Crisis 2008/9. And unfortunately, the Euro area was affected even more. We had a slump of seven percent GDP. I think that one good thing that came out of the crisis in 2008/9 is that policy setters have learned that we have to respond decisively. This time, the decisions were much more fundamental, the fiscal programs and the monetary response. We have seen governments providing direct support to small businesses, to households, unemployment insurance, etc. And there is also in Europe, for example, the Recovery and Resilience Facility, which is a 700-billion-euro

pact where member states can receive funding from the European Union for investment projects that ought to lead to job creation and also to have some positive environmental effects. At the same time, the central banks have provided funding to the economy very aggressively, both in North America and in Europe. Were these programs successful? So far, so good. We can say that financial markets at least seem to have quieted down. Stock markets are beyond where they were before the crisis. These fear indices, volatility indices, are essentially almost back to normal; it looks like these programs were successful in restoring confidence. Why do economists believe that such programs are necessary? There are many reasons. But I just want to emphasize one, which is what we call multiple equilibria in economics. An economy could tend towards a bad equilibrium where everybody starts to panic, and we have the expectation that companies will go bankrupt, so banks stop lending. It is a self-fulfilling prophecy, and we are moving to the bad equilibrium. And then there is also good equilibrium, hopefully, where expectations are positive. Where we hope that things are not as bad as we expected them initially to be. And

that is where we seem to be heading. The question is, are there any dangers that can affect the longer-term resilience of economies? Unfortunately, this is the case, because all these programs essentially work through debts, they lead to leverage. Central banks' balance sheets have essentially doubled; at least the Fed's balance sheet has more than doubled, and that is through leverage. It led to an increase in leverage of corporations and it led to an increase of leverage in several countries. Leverage is essentially another word for higher levels of borrowing. Unfortunately, high leverage has very unpleasant consequences. It leads companies to be less dynamic. It leads central banks to be restricted in their policy options and it makes governments less able to respond to future crises. I think this is the big challenge: to make sure corporations are pushed towards more equity, banks are monitored so as not to have too high leverage in Europe. We have what we call the doom loop: If banks load up on a country's government bonds and the government is getting in trouble, well, then the government bond prices are dropping. The banks are getting into more trouble. Governments must rescue them. This is a doom loop where the

sovereign risk and the financial institution risk sort of interact in a very unfavorable way.

TOM MARRIE

To tackle the question *"What Is the Potential and What Are the Limits of Monetary and Fiscal Programmes to Cope with COVID-19?"*, Darren and I consulted with two economists together, because this is an area where we have one economic working group. We acknowledge the contributions of Jack Mintz PhD, Professor at the University of Calgary, and Craig Wright, Chief Economist, Royal Bank of Canada.

1. During the pre-vaccine stage, from January 2020 to January 2021, the control measures enacted by the Government of Canada to mitigate the pandemic resulted in many people being unable to work. The impact of these measures varied across sectors of the economy, with tourism, hotels, travel and retail, being among the hardest hit, and within these sectors women were often more affected that men. A differential impact has also been observed in terms of income levels with Canadians who earned < $800/week being impacted more than those who earned >$1200/week.

The government initiated various programs designed to support Canadians and businesses, costing a total of $240 billion so far. However, evidence suggests that the supports may have been excessive. Canada seems to have been an outlier in this respect when compared with European countries.

The next stage is rebuilding once COVID-19 has been controlled by vaccination, and may include strategies used during the pandemic. For example, many people were able to use various electronic platforms, enabling them to work from home, and in the future one will see a hybrid model – a mixture of working at home and going to the office. This will have an effect on business real estate, especially in larger Canadian cities such as Toronto, Vancouver and Montreal, as well as impacting business travel. The extent of these changes, and their impacts, will only become apparent with time.

2. E-health, e-education and e-commerce will be critical to a successful future. Canada has strength in these areas.

3. The tenuous nature of many of Canada's supply chains became apparent early in the first wave of the pandemic, including our lack of vaccine manufacturing capacity. How Canada and other countries respond to these issues will have wide-spread impacts. Likely there will be a development of regional supply chains. This may pose a challenge for Canada, which has historically benefited more from multilateral trade arrangements than from bilateral arrangements.

4. The Royal Society of Canada has examined a wide variety of societal issues in the context of the pandemic. In order to emerge from COVID-19 as a better society than before, investment will be required in a number of social programs, for example universal childcare, while dealing with the debt that has been accrued over the past year. There are several ways to deal with this – hold the line on spending and let natural growth bring down the debt. We are now relying on immigration for population growth. We have an aging population, so labor productivity becomes an issue. Indeed, since 2016 we have shown no increase in labor productivity

in Canada. An increase in taxes is likely, but this has to be carefully applied to a population with one of the highest tax rates amongst OECD countries. Inflation is likely to occur and will require monetary policies to control it.

5. The transition from carbon-based energy to renewable energy sources is a must. The oil and gas industry in particular will need help to achieve this transition.

Most importantly, Canada cannot forget what we have learned during this pandemic and, in analyzing what worked and what did not, we need to use these lessons to be much better prepared for future public health emergencies.

JOSEF ZECHNER

I think there is no disagreement here. I think the supply chain in Austria in certain areas is just as non-resilient as you probably experienced in Canada. One thing we have learned as economists is that it is not only efficiency that counts, it is resilience. What we call the just-in-time supply chain, we need to move to just in case: if something happens and our supplier is not able to deliver, we must have a plan B

or even a plan C. Having said that, I do not think we should necessarily encourage these anti-globalization or anti international trade notions. But you need to have a more diversified supply chain.

The other thing you mentioned is: What do you spend the money on? The 1.9 trillion that the US just approved; they do not have a lot of long-term investment projects in that. They pay out a lot in terms of checks to families, 1400 dollars to every U.S. household if you are below a certain income level. And that is going to be the challenge: to channel these funds into useful investment projects which improve infrastructure. As you said, e-learning, e-health and so on.

Concerning Sylvia's question "Will COVID-19 become a catalyst for a more resilient economy?": I think it is a big takeaway that resilience is all of a sudden at the center for portfolio managers and other economic decision-makers. I have also seen in my own empirical work that corporations that have a good performance in what we call E and S, which is environmental and social – there are ratings now for these dimensions – have been suffering much less than others, e.g. the mining industry. I think investors are increasingly be-

coming aware of the concept of resilience that is linked to these dimensions of social and environmental performance. But, you know, there are challenges, disclosure problems. Do we really have all the information, as investors or as consumers, about the carbon footprint of these companies? I think the European Union has made some useful initiatives there, to introduce a dictionary defining what we mean by sustainability, so that investors have an easier time when they make their decisions.

TOM MARRIE

The RSC working group on the economy produced a report entitled "Renewing the social contract: economic recovery in Canada from COVID-19". This group had 16 recommendations which fell into four categories. These recommendations provide the basis for us to develop a better society emerging from COVID-19. If these are implemented widely, they will indeed serve as the basis for a more resilient economy.

A. Renew the social contract:
   Establish a basic income guarantee that is universally available. Ensure paid sick leave and universal

access to child care. Implement a comprehensive tax reform.

B. Reinvigorate the economy:

Develop clean competitiveness road maps, invest in a comprehensive and secure digital infrastructure and ensure the transition of the labor force from carbon intensive industries.

Undertake a risk assessment of Canada's exposure to global supply chains.

C. Enabling Innovation:

Develop a clear vision for the objectives of innovation policy and specify general flexible metrics for assessing success.

Create flexible, arms-length institutions with stable, long-term funding to provide resources and programs to firms to spur innovation by sector and/or region.

Identify clear specific missions for innovation policy, such as decarbonizing the economy and accelerating the shift to and growth of the digital economy.

For truly global endeavours, such as the life sciences, government must support engagement in global research networks.

D. Improving Crisis Policy Responses – Establishing Standing Crisis Response Teams:

Develop systems for citizen engagement with a policymaking process that actively encourages and incorporates feedback from the Canadian public.

Fund and facilitate better data collection, including health, economic, education and environmental indicators, ensuring that these data includes demographic and socioeconomic indicators and are readily available to experts based within and outside of the public service.

Develop and disseminate an intersectional approach to policy development and analysis to provide decision-makers with a more accurate and comprehensive picture of problems, the potential benefits and costs of solutions and how these are distributed across society, especially marginalized groups.

SYLVIA KNAPP

I want to come back to one of the questions I was planning to discuss, which is *how to prevent the marginalization and potential discrimination of certain societal groups*. You previously mentioned Indigenous peoples in Canada and how to ensure the involvement of more diverse stake-

holders. Lots of women are victims of this pandemic for many, many reasons, and so are less privileged citizens and the elderly. What are your opinions on this?

TOM MARRIE

One of the things that COVID-19 has been good at is exposing all the weaknesses in our societies. In almost every instance these weaknesses have antedated COVID-19. Invariably some groups have suffered more. What COVID-19 has given us is an opportunity to correct these weaknesses as we recover from this pandemic.

We have had working groups prepare policy documents on Indigenous Health and Wellness, The Impact of COVID-19 on Racialized Communities, Homelessness, Correctional Services, Mental Health, Restoring Trust: COVID-19 and the future of long-term care. In preparation – Immigration; Migrant workers.

Most individuals in these groups have had a disproportionate burden during COVID-19. The elderly in long-term care facilities accounted for 85% of the deaths in Canada due to SARS-CoV-2 during the first wave.

The reasons for this include multi-occupancy rooms; poor infection control processes; personal care workers working at more than one home and bringing infection from one to the other; inadequate numbers of personnel to provide care in the face of large numbers of infections, because of infection involving the workers and many workers not coming to work because of fear of contagion. Prevention includes better home design with single occupancy rooms; ability to isolate patients within the facility; better pay for personal care workers so that they only have to work at one facility. Most importantly, development of national standards for long-term care for Canada is necessary.

Correctional services, both institutional and within the community, are significantly impacted by COVID-19. The COVID-19 pandemic has shown that those living and working in correctional facilities are particularly susceptible to exposure to potential contagions. Canadian correctional institutions, like prisons in many other countries, are affected by high population turnover, "overcrowding and restricted movement, inaccessible or poor health care, [...] high prevalence of chronic disease and comorbidity,

and an aging custodial population [which] exacerbate [...] risks" and fears of contagion among staff, officers, and incarcerated persons. Preventing and then mitigating spread of COVID-19 within correctional services has to be at the same high standard as for the rest of the community. What we have learned during COVID-19 is that many of those who are in remand do not need to go to prison; they can serve their sentence in the community. Moreover, there is no reason for intermittent sentencing (e.g., if persons can spend the week in free society, why do they need to be incarcerated on weekends? Moreover, weekend incarceration disrupts prison living and can be the source of contraband making its way into the institutions). With decarceration, staff can place more emphasis on the rehabilitative efforts directed toward those who remain in custody. Indeed, in an effort to comply with social distancing early on in the pandemic many prisoners were released with no known untoward effects. To continue being successful, decarceration involves a greater investment on the part of governments into community correctional services, specifically in staff who provide oversight and supervision to those released with con-

ditions. Of course, we must also recognize those who remain in custody during the pandemic. To this end we encourage rapid testing, daily screening, physical distancing, and the use of cohorts within the institutions to contain the spread if the virus is introduced. Moreover, vaccinations are necessary for prisoners and staff – who are invisible essential service providers during the pandemic.

A key element of a prevention or mitigation strategy for homelessness is to plan for and implement a reconfigured shelter system that supports a Housing First approach with rapid triage to subsidized housing or stabilization of mental health and addictions followed by transfer to a supportive housing environment.

Even before COVID-19, Indigenous and racialized groups, particularly Canada's Black populations, have had an increased risk of a number of illnesses, poorer access to care and worse health outcomes. These have been exacerbated during COVID-19. Race-based data have not been collected in Canada. Nevertheless, in areas where these data are collected, the impact of COVID-19 on racialized communities is several times that of non-racialized communities. Most, 85%, of our risk of illness is linked to

the social determinants of health including income, housing, education, systemic racism and access to health care. Mitigation strategies here are to improve the social determinants of health. This is a long-term objective, but provision of a guaranteed minimal annual income would be a good start.

Another complex yet fundamental question that we need to answer if we are to do better in the future: "*How can we find a better balance between citizen rights and citizen health in pandemics in the future?*" This question can be examined from several perspectives:

Legal: In a Policy Briefing prepared for the RSC called "Reconciling Civil Liberties and Public Health in the Response to COVID-19", a team of authors lead by Professor Colleen Flood examined whether or not the mitigation strategies to curtail the pandemic in Canada have infringed on the rights and freedoms of Canadians as guaranteed in the Canadian Charter of Rights and Freedoms. They concluded: "Rights are not trumps against the collective goal of public health; what rights demand of government, instead, is reasoned justification – evidence showing that interferences with civil liberties are proportionate to government aims. In

this sense, the vigilant defense of civil liberties can encourage the timely revisiting of precautionary measures – something that has been a challenge in its application to public health. As such, a dynamic, evidence-based policy approach can be fully respectful of both civil liberties and the goals of public health."

Societal: While in many countries most citizens have been compliant with public health measures to curtail the pandemic, there is a significant fraction of every society that has not complied. Some of the reasons for this are mistrust in the state, a feeling of infringement on my rights and others. There has also been significant hardship placed on citizens such that compliance has enduring impacts – for example, not being able to visit an elderly parent or relative in a nursing home that is on lockdown has been devastating.[3] In some instances there has been haphazard application of the rules, e.g. fining someone who is walking in a park when there is no one else around at the time. In a country such as Cana-

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[3] See Estabrooks CA, Straus S, Flood, CM, Keefe J, Armstrong P, Donner G, Boscart V, Ducharme F, Silvius J, Wolfson M. Restoring trust: COVID-19 and The Future of Long-Term Care. Royal Society of Canada. 2020.

da, with 10 provinces and 3 territories where health is a provincial responsibility, the rules not infrequently differ from province to province and while in many instances this is necessary, it is also confusing.

A second challenge is that it has underappreciated how individuals interpret risk. In an IPSOS survey early in the pandemic on February 14 and 15, 2020 involving 8,001 citizens from nine countries – Canada, US, UK, Germany, France, Australia, Russia, Italy and Japan – in general, individuals felt the danger posed to them by the pandemic was less than it was for the population in their country and to the world. Concern about the pandemic differed markedly at this early stage, with the highest levels of unconcern being present in Germany and Russia while the highest percentage of those who feared the pandemic was in Japan at 55%; the next highest was 21%.

A third societal consideration is that physical distancing and hand hygiene are often easier for wealthy people. In Canada, rates of compliance with these two measures are higher among persons with an annual income of > 100 K than below 40 K – 94% vs 85%. The general implication is that in pandemics, risks are

not spread evenly and tend to accentuate societal concerns about inequity and injustice.

In some communities multigeneration congregate living makes isolation difficult.

There has been failure to appreciate just how much quality of life means to people. In August 2020, Engage NS surveyed 12,827 Nova Scotians using 230 questions. When asked how we should measure success, 58% said growth in the economy; 82% said improvement in quality of life. The effect on quality of life and how to improve it has been underemphasized during the pandemic.

We now understand a lot of the above-mentioned mitigation factors better (there are others that I have not mentioned) and if we integrate this understanding into planning for the remainder of this and for future pandemics, we can find a better balance between citizens' rights and citizens' health.

One example of this is tailoring mitigation measures with greater nuance on a regional basis. Tailoring communication to various sectors of the population is also a key – in wave 2 in Nova Scotia, Canada those in the 20 to 29-year-old age group accounted for 44% of the 520 cases while in wave 1 they accounted for 13% of 110 cases. This group constitutes 12% of the NS population. In contrast, in wave 1 those 70 years of age and over accounted for 26% of the 1100 cases while constituting 16% of the population. In wave 2 they accounted for 2% of the cases. In the older age group many of those impacted by the pandemic were in long care, and therefore the communication strategies intended to mitigate transmission are going to be significantly different than for the younger age group, where spread is more likely related to social behavior.

SYLVIA KNAPP

I want to start bringing in some of the questions, and since we just talked about resilience, Verena Winiwarter states a resilience question, which I want to read out: "Increasing resilience should be a global priority, not only economically, but in terms of sustainability. Has the Royal Society embraced that one health approach, which, in my opinion, is connected to resilience and sustainability?"

TOM MARRIE

One health, and I hope the questioner means the same thing, is really a triangle that encompasses human, animal and environmental health. But it is an entire spectrum, which is really important. We have not dealt with that specifically in the study questions we have been working on. However, it is a key underpinning of many of the other initiatives that are underway in Canada. And for a long time in our medical schools, we have neglected to emphasize one health. Now that has changed. I think that one health is really critical as we go forward and we need to understand what it means in different areas.

SYLVIA KNAPP

You provide all this, as you call it, evidence-based Informed Perspectives and information to politicians. Is there a way to also figure out if they adhere, if this changes something? Are you evaluating the outcome of these recommendations?

TOM MARRIE

It is a great question and one that we have talked about a lot and agonized about. We have a couple ways of trying to measure impact, which are under development.

DARREN GILMOUR

As for the pieces that we have published called Informed Perspectives, one hundred and thirty of them have been read four hundred thousand times, about 4000 times per article. We know that because our partner, The Globe and Mail, is one of two major newsrooms in the world whose online activity is operated through an algorithm. And they have really sophisticated capacities at the Globe and Mail to track impact through twenty-seven different metrics of how, when, who, where. So, we are aware of the extent of the reach of the Informed Perspectives. I would say that increasingly, and I think Tom would agree, we have been hearing directly from most senior leaders in the public service federally, who have received embargoed copies of our reports and reach out to us because they would like to speak with the

authors of those reports about how they might take first steps. Much of this work is not headline grabbing, nor do we seek to make it public. But it is heartening to know that the policy briefings are being read because governments everywhere are keen to be aware of the latest insights and the latest evidence that can drive action. And the task force and its working groups have generated that in an accessible, readable format. So, the impact is not always a straight line. You deliver a report and six months later they do everything and there is a party. But there are more than slightly discernible indications where we can draw quite a clear line between the work of one of the working groups and a policy outcome from government.

SYLVIA KNAPP

There are many people complimenting you on your activities at the Royal Society of Canada. I would like to do this too, and I am really impressed and privileged to have you on my panel. Thank you very much to all the panelists.

SYLVIA KNAPP *is Professor of Infection Biology at the Medical University of Vienna. Her research focuses on Infectious Diseases, Immunology, and Intensive Care Medicine. In 2014 she was elected corresponding member of the OeAW.*

TOM MARRIE *was Dean of Dalhousie's Faculty of Medicine from 2009 to 2014, a post he assumed after five years in a similar role at the University of Alberta, preceded by five years as Chair of the Department of Medicine at the University of Alberta. Dr. Tom Marrie previously spent 22 years as an educator and physician at Dalhousie, establishing the university's Division of Infectious Diseases. Since April 2020, he has served as Chair of the RSC Task Force on COVID-19.*

DARREN GILMOUR *is Executive Director of the Royal Society of Canada. Raised in New Brunswick, Canada, Darren did his graduate work in Nairobi, Kenya, prior to becoming Executive Director of the RSC in 2008. During the time of Darren's leadership, the RSC has acquired and renovated its first permanent home and created the RSC College.*

ASTRID MAGER *is a senior postdoctoral researcher at the Institute of Technology Assessment (ITA), Austrian Academy of Sciences (ÖAW), and teaches at the Department of Science and Technology Studies, University of Vienna. She is currently working on her habilitation project "Algorithmic Imaginaries. Visions and values in the shaping of search engines", funded by the Austrian Science Fund (FWF).*

JOSEF ZECHNER *is Professor of Finance and Innvesetements at the Vienna University of Economics and Business. He has been president of the German Finance Association, the European Finance Association and the Western Finance Association, among others. Since 2004, he has been a full member of the Austrian Academy of Sciences.*

PANEL 4
ARCTIC AND ALPINE ENVIRONMENTAL CHANGE

Chair:
John P. Smol, RSC

Panelists:
Lindsey Nicholson, OeAW
Günter Köck, OeAW
Jakob Abermann, OeAW
Derek Muir, RSC

JOHN P. SMOL

Both Arctic and alpine ecosystems have been referred to as the "miners' canaries of the planet"; meaning that, due to a variety of positive feedback mechanisms, they are often the first to respond to climatic and other environmental changes, and to the greatest degree. Importantly, changes in polar regions affect ecosystems world-wide (e.g. ocean levels and global circulation patterns). Likewise, melting alpine glaciers result in striking economic, social, and environmental issues, as mountain regions act as "water towers", supplying downstream populations with water for agriculture, industry, and drinking purposes. However, once the glaciers melt, the flow of water stops.

Disappearing sea ice and melting glaciers linked to anthropogenic climate change dominate most discussions of human impacts on Arctic and mountainous regions. Such an emphasis is clearly warranted, but a myriad of other anthropogenic stressors, often acting synergistically, are also affecting these ecosystems as well as the peoples who depend on them. These changes are frequently occurring "under the radar", slowly and often imperceptibly to most observers.

Multiple anthropogenic stressors are changing these ecosystems, often outpacing our ability to collect data on baseline conditions and trajectories of change. Despite the importance of these ecosystems, little long-term monitoring data are available. Given that most scientific departments and researchers are "discipline-based", multidisciplinary perspectives are often neglected.

In this session, with the input of diverse panelists I hope to also explore the following broad questions:

- How have sentinel Arctic and high-altitude ecosystems been affected by human-induced climatic and other environmental changes?
- Are these changes reversible?
- What does the future hold?
- How is it best to deal with the complexities of transboundary issues?
- What are the ecological and social repercussions of these changes?
- More specifically, I believe the following emerging challenges may be important discussion topics:
- Melting ice remains an issue that is clearly visible, but more subtle changes are also occurring. One key ecosystem change is thawing permafrost in Arctic and alpine regions. What are the long-term repercussions on the global climate system with the release of greenhouse gases from thawing permafrost? Is thawing permafrost also releasing nutrients and contaminants, previously believed to be locked in frozen soils? How are downstream rivers and lakes, as well as estuaries and oceans, affected, along with the organisms they support? Are there any direct human health effects?
- Decreasing Arctic sea ice is often in the headlines, with important ecological, economic, and social repercussions (especially for Northern peoples who use ice as a transportation and hunting platform). But lake ice is also declining rapidly in polar and alpine regions. What are the long-term repercussions? Are there interactive effects with, for example, contaminants?
- It is now well established that many Persistent Organic Pollutants (POPs) and other contaminants are transported long distances from industrial sources to Arctic and alpine ecosystems. How will continued climate warming affect these problems?
- With warming, many species are "on the move", meaning plants and animals are steadily moving north and to higher elevations,

when niches become available with warming. Whilst there may be some short-term advantages to some of these species' movements (e.g. new species of fish for Indigenous peoples to harvest), these shifts are also often displacing native taxa (e.g. Arctic charr). What are the long-term socio-economic and ecological repercussions of these invasive species?

- Declining sea ice conditions are enabling shipping vessels from around the globe to pass through Arctic waters. What are the potential environmental and sociological repercussions of this expansion in shipping routes?
- For many people, Arctic and alpine regions seem far away from direct human impacts. However, many activities, not least of which include mining, are encroaching on these ecosystems. Such activities will likely only increase in the future. Whilst these activities provide employment and other economic benefits, the long-term environmental repercussion are rarely taken into full consideration.
- Mountain glaciers often provide the water used directly by humans (e.g. drinking water), as well as for industries and agriculture.

As mountain glaciers thaw at an alarming rate, such as those in the Andes, water flows may greatly accelerate in the short term, but as the glacier disappears, the flow of water will soon stop. This raises critical social, economic and ecological issues.

- Many of the environmental problems associated with Arctic and alpine ecosystem change are linked to stressors originating far from these regions, yet peoples living and relying on these ecosystems are typically on the "front line" of these negative impacts. How should society deal with the social injustice that these changes cause?
- People who live close to these vulnerable ecosystems have much information and insights to offer scientists regarding local and traditional knowledge. How can we effectively work with local peoples and traditional knowledge holders to collectively inform decision-makers on best practices and the urgency of action?

The challenges of addressing ecosystem change in Arctic and high-altitude regions are amplified because, in most cases, they are far from large population centres and are therefore more easily ignored by politicians and policy makers. However, given their linkages to the global climate system and the critical roles they play in global environmental issues, pretending these problems are far away is not a viable alternative to progressive and evidence-based action.

LINDSEY NICHOLSON

Ice is an integral part of Earth's climate system and changes in the cryosphere have profound effects both locally and far beyond the regions where ice is found on Earth, for example, altering water availability, sea level rise, atmospheric and ocean ice circulation, and surface energy fluxes, all of which have knock-on effects on ecosystems and human societies. In essence: "What happens in the Artic and Alpine regions does NOT stay in the Artic and Alpine regions" and is therefore of interest to all humanity.

Mountain glaciers are undergoing strong recession. For example, the European Alps are projected to retain only about 5-35% of the 2017 glacier volume by the end of the century[1],

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[1]   Zekollari, H., Huss, M. and Farinotti, D., 2019. Modelling the future evolution of glaciers in

meaning that in the worst scenario for the glaciers, the children of today will live to see the Alps deglaciated. Locally, this would be a significant cultural and economic change underlain by adjustments to the local water cycle, sediment flux, vegetation, ecology and natural hazards. The mechanisms and controls of projected change in glaciers are relatively well understood through the application of robustly tested regional/global glacier models that are forced with projected climate conditions[2]. The greatest uncertainty relates to the future climate conditions, which is tightly bound to the choices humanity makes in the coming decade[3].

At a global scale, mountain glaciers are projected to contribute about 10-20 cm to sea level rise by the end of the century[4]. The focus of ongoing research is to understand the local and regional consequences of declining mountain glaciers and snow cover, and develop appropriate adaptation strategies, focused on the greatest regional risk.

In the Arctic, amplification of the climate warming system may be caused by rapid atmospheric processes[5], but, also, climate change is causing decline in the surface cover of sea ice, glaciers and snow, all of which instigate a strong positive feedback

loop whereby lowered regional surface reflectance causes enhanced local heating and therefore further exacerbates regional ice/snow loss. A well-known example of this is the decline in sea ice cover in response to anthropogenic climate change, with the expectation of an ice-free summer Arctic Ocean by mid-century, or even in as little as a decade (e.g. Screen et al., 2019)[6]. The global mean climate forcing effect of the decline of Arctic sea ice during 1979–2011 has been determined to be equivalent to a quarter of the direct radiative forcing from rising CO_2 over the same period, and so has a significant influence on the planetary climate trajectory[7], as well as profound consequences for the Arctic Ocean ecosystem. While an ice-free summer Arctic Ocean is expected with a high degree of confidence, the complete suite of knock-on effect of this are still under investigation. Further to the projected loss of

the European Alps under the EURO-CORDEX RCM ensemble. The Cryosphere, 13(4), pp.1125-1146.

2   Hock, R., Bliss, A., Marzeion, B.E.N., Giesen, R.H., Hirabayashi, Y., Huss, M., Radić, V. and Slangen, A.B., 2019. GlacierMIP–A model intercomparison of global-scale glacier mass-balance models and projections. Journal of Glaciology, 65(251), pp.453-467.

3   IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V.,

P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)].

4   IPCC, 2019: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)].

5   Previdi, M., Janoski, T. P., Chiodo, G., Smith, K. L., & Polvani, L. M., 2020, Arctic amplification: A rapid response to radiative forcing. Geophysical Research Letters, 47, e2020GL089933. https://doi.org/10.1029/2020GL089933

6   Screen, J.A. and Deser, C., 2019. Pacific Ocean variability influences the time of emergence of a seasonally ice-free Arctic Ocean. Geophysical Research Letters, 46(4), pp.2222-2231.

7   Pistone, K., Eisenman, I. and Ramanathan, V., 2019. Radiative Heating of an Ice-Free Arctic Ocean. Geophysical Research Letters, 46(13), pp.7474-7480.

the summer sea ice, melting of both the Greenland ice sheet and the high latitude permafrost have the potential to cause global scale disruptions to climate[8]. Increasing freshwater discharge from the ice sheet affects the global ocean circulation by inhibiting the sinking of ocean water in the North Atlantic basin, while the release of greenhouse gases currently locked up in permafrost could present a major addition on top of future anthropogenic emissions. Both of these factors remain subject to large uncertainties in our understanding of the processes and timing of change, and substantial primary research is being undertaken to narrow down these uncertainties.

GÜNTER KÖCK

When I started my research on heavy metal contamination of Arctic char from high mountain lakes in the Austrian Alps in the late 1980s, climate change was of course already

a reality at that time. However, little was known about its far-reaching effects on ecosystems and society and its speed. At that time, our study showed that changes in lake temperature had an impact on the metabolism of fish and, subsequently, on their heavy metal load. This led us to conclude that there was a link between climate change and metal contamination of fish. My idea then was: Arctic and alpine lakes are two very similar and sensitive ecosystems and, moreover, host the same fish species, namely Arctic char. So, if we found similar results in the Arctic, we would have a kind of global biomonitoring system for the effects of climate change on aquatic ecosystems. On this basis, I started to set up the Austrian-Canadian cooperation project HIGH-ARCTIC in 1997. When my friend and colleague Derek Muir (Environment & Climate Change Canada), also a member of this panel, joined the project, the initially small collaborative project took off incredibly and has developed into a renowned long-term project with many scientific aspects, running since 1997.

Looking back on my 35 years of research in Arctic and alpine ecosystems, I have to confess that I am

still and always will be particularly amazed by one aspect of climate change: namely, its tremendous complexity! Whereas at that time we naively considered the effect of ambient temperature on fish metabolism to be the sole driver of metal contamination in fish, today, thanks to our Arctic Project, we know of a number of factors (e.g. the duration of lake ice cover or the food spectrum) that affect metal uptake in Arctic char[9]. And we must admit that the complex interrelationship of some factors is still not fully understood.

Another good example of complexity is one of our alpine lakes studied more than 20 years ago: here, during a re-sampling a few years ago, we saw that climate warming had not led to an increase in cadmium (Cd) contamination in Arctic char, as originally suspected, but surprisingly to a considerable decrease in the metal burden. The reason is that melting

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[8] IPCC, 2019: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)].

[9] Hudelson, K.E., Muir, D.C.G., Drevnick, P.E., Köck, G., Iqaluk, D., Wang, X., Kirk, J.L., Barst, B.D., Grgicak-Mannion, A., Shearon, R., Fisk, A.T. (2019). Temporal trends, lake-to-lake variation, and climate effects on Arctic char (*Salvelinus alpinus*) mercury concentrations from six High Arctic lakes in Nunavut, Science of The Total Environment 2019 (*678*), 801-812. DOI: 10.1016/j.scitotenv.2019.04.453.

permafrost and weathering processes have changed water chemistry, namely by increasing pH and calcium (cation) concentrations, leading to a decrease of the Cd bioavailability to fish[10].

This example shows that the effects of climate change on ecosystems do not necessarily always have to be negative. However, this assessment is highly dependent on the viewpoint of the observer. As John Smol has noted, climate change is enabling fish species previously adapted to warmer waters to migrate from temperate latitudes further toward the Arctic. On the one hand, this would provide the Indigenous population with the opportunity to fish for additional fish species. On the other hand, however, invasive species could displace the native species and thus permanently change the ecosystem. The same applies, of course, to other animal and plant species. We know that many plant species are moving from valley sites towards the mountain tops[11]. For example, the tree line in the Alps will probably be more than 300 m higher in 50 years than it was 10 years ago. Is it positive or negative if more trees grow on the mountains, if plant species disappear on alpine meadows, but more cows can be kept due to the higher-growing grass? The rising temperatures allow invasive animal and plant species to settle permanently in our regions. However, these alien species have the ability to severely alter ecosystems and are a threat to the biodiversity of a region.

It is a fact that ecosystems and landscapes will undergo massive changes in many cases. Should we react to these habitat changes or should we let nature take its course? Especially for protected areas such as national parks or biosphere reserves, severe conflicts arise here that can only be solved with the involvement of many stakeholders.

It is a fact that climate change is considerably more than just an increase in mean ambient temperatures. Changes in the distribution and amount of precipitation, the increase in extreme weather events or regionally different developments trigger changes with sometimes far-reaching consequences for ecosystems and society. In many cases, the occurring manifold feedback effects are still poorly understood or even unknown. However, this is precisely what makes it so difficult to assess the consequences of climate change. From my point of view, this especially concerns the economic and social impacts! As John Smol mentioned, many changes are not perceived by people because they often happen far away from the urban centres. Unless a thawing permafrost-driven landslide is threatening someone's home, it is difficult to get people to understand that climate change will not only alter the landscape in which they live but will most likely profoundly alter their previously accustomed lifestyles, and most certainly those of their children.

If asked which development worries me the most, I would spontaneously

[10] Köck, G., Muir, D., Lackner, R., Tessadri, R., Koinig, K. (2015). Temporal trends of heavy metal concentrations in Arctic Char (*Salvelinus alpinus*) from an Austrian High Mountain Lake: effects of climate- induced changes in lake water chemistry. Conference Proceedings of the SETAC Europe 25th Annual Meeting „Environmental protection in a multi-stressed world: challenges for science, industry and regulators", 3-7 May 2015, Barcelona (Spain), p. 197.

[11] Steinbauer, M.J.; Grytnes, J.; Jurasinski, G.; Kulonen, A.; Lenoir, J.; Pauli, H.; Rixen, C.; Winkler, M.; Bardy-Durchhalter, M.; Barni, E.; Breiner, F.T.; Burg, S.; Dawes, M.A.; Matteodo, M.; Stöckli, V.; Zimmermann, N.E.; Wipf, S. (2018). Accelerated increase in plant species richness on mountain summits is linked to warming. Nature, 556, 7700: 231-234. doi: 10.1038/s41586-018-0005-6.

name two points from the multitude of threats and challenges:

The rising economic activity in the Arctic region
Decades after the Arctic boom during the Cold War, climate change is leading to a renewed surge of interest in the Arctic. The reason is simple! The Arctic region is rich in mineral resources such as metal ores as well as oil and gas. Due to the climate-change-induced decrease in sea ice, these resources are now becoming more accessible. In addition, new shipping routes are becoming possible. For example, the sea route from Rotterdam to Tokyo via the Northwest Passage or Northeast Passage is several thousand kilometres shorter, faster and thus considerably less expensive than the normal route through the Suez Canal. The dwindling sea ice also allows international fishing fleets to venture further north to exploit the rich fish stocks of the Arctic Ocean. All this makes the Arctic region interesting as an economic area and for world trade! The race for the treasures of the Arctic has already begun; the Arctic states are visibly asserting their territorial claims and investing enormous sums of money. It is also certain that these interests

are loaded not only with high conflict potential, but also with scarcely responsible environmental risks. In the case of an accident, for example involving an oil tanker, the consequences for the sensitive Arctic ecosystems would be a real nightmare! Furthermore, increasing underwater noise levels along shipping routes caused by ships can also negatively affect the behavior of marine mammals.

The dramatic decline in biodiversity
Biodiversity decline has accelerated dramatically in recent decades. For example, according to the IPBES Report 2019[12], of the estimated eight million animal and plant species worldwide, about one million are at risk of extinction. Climate change not only affects individual animal and plant species, but also influences their coexistence in communities (e.g. predator-prey relationships or pollination symbioses between animals and plants) and thus entire ecosystems, including their productivity and what we call ecosystem

[12] IPBES (2019). Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Global Assessment Report on Biodiversity and Ecosystem Services. https://www.ipbes.net/global-assessment

services. Healthy ecosystems provide vital services that we take for granted. Clean water and air, high quality soils and sustainable food supply depend on the biodiversity of our planet. Furthermore, high biodiversity also increases the resilience of ecosystems to climate change. For the Alpine region, one possible measure would be to make people aware of the essential importance of biodiversity for the long-term security of their livelihoods.

It is perhaps ironic that the current COVID-19 pandemic, with its wide-ranging impacts on almost all aspects of our lives, has served to make people aware of the fragility of our planet and our society. We should seize the moment to further anchor this experience in people's minds and to demonstrate that it is high time to put aside economic profit-seeking in favour of long-term preservation of the quality of life. This could help to engage in the renunciation in many areas of our lives that is necessary to combat and adapt to climate change and its consequences. Only in this way it is possible to secure an environment worth living in for future generations, as well.

JAKOB ABERMANN

One main challenge of our days is rapid climate change. In contrast to climate fluctuations of the past, we now know with a high degree of certainty that humans influence this ongoing change; and moreover, the number of people sharing the planet is unprecedentedly high. In this context the human imprint on ecosystem changes is strong and it is a focus for socio-economic analysts around the globe.

The Arctic and high mountain areas give a different perspective on these changes. While they are inhabited by few people, their resources literally feed billions. Melt water from glaciers or the seasonal buffering of water resources through snow that secures water flow during phases of otherwise low flow in the lowlands are prominent examples. Also, and this is more relevant for the polar regions, the freshwater flux from the vast amounts of snow and ice impact downstream terrestrial and marine ecosystems. Primary productivity in Arctic fjord ecosystems relies on fresh water provided by surface melt. Under the ongoing human-induced climate change mentioned above, the pristine ecosystems of the polar re-

gions as well as the mountain regions serve as unique natural laboratories where we can assess the complexity of the current challenges: changes triggered in the strongly populated areas of the world can affect otherwise untouched ecosystems. A quantification of these complex interrelations is vital in order to get a full picture of climate change impact – from cause to effect across thousands of kilometres.

Furthermore, the pace of climate change is anything but uniform across the planet. In this respect, high latitudes as well as high altitudes play an important role: Arctic amplification implies an accelerated warming in polar areas and at high altitudes of continental mountain ranges. Feedback mechanisms across scales are the origin of these differences, and they in turn impact global circulation by reducing the strength of latitudinal gradients. Our understanding of these feedback mechanisms has increased in recent years - the foundation of this knowledge, however, is long-term data that allows for quantifying spatial differences and trends.

Over more than a century, scientists have contributed to providing baseline data on the state of ecosystems.

We are benefiting from these data now, as sometimes their value only becomes clear decades later. The so-called 'Keeling curve' of CO_2 evolution that we now use as the pivotal foundation of climate change was on the brink of being interrupted due to funding issues in its early years. Now we are grateful to be able to place our modern and ever-advancing monitoring in such a long-term context. In the Arctic, systematic ecosystem monitoring is still comparably sparse, and it is in the nature of a complex system that the lengths of time series need to exceed the natural variability in order to address impact and trend assessments. Ecosystem changes, although impressive and impactful, do usually occur gradually and subtly, which is why long time series as well as high precision with reproducible protocols are needed in order to be able to make firm statements both of the current state but also of changes. Long-term monitoring is usually site-specific and the spatial representativeness of the conclusions reached needs to be addressed. An additional value of long-term ecosystem monitoring lies in capturing extreme events. Depending on the variable assessed, some very few strong events can produce the major quan-

tity of a given time-series. Also, particularly true for the high latitudes, seasonal cycles are very pronounced and strong day-to-day changes occur regularly. In order to assess what is part of a current state and what can be attributed to a changing ecosystem, we need to meticulously collect base-line data that increase in value with every added season.

Advances in Earth observation from space help to solve some of the issues identified here and it is evident that increasing repeat cycles, resolution and more advanced sensor configurations will lead to an increase in their importance in the future. However, our understanding of large-scale dynamics is still – and will likely remain – dependent on surface-based monitoring, not least because of the small-scale variability of complex systems and the interdependence of different 'bricks' within the ecosystem. In this context, there are several outstanding initiatives that show the importance of an interdisciplinary view on changes, which helps identifying drivers and impacts. A limitation of satellite-based assessments and reconstruction is the temporal frame: With these methods, we do have a strong potential to analyze changes during the past four dec-

ades but not much longer. We should therefore, in this context, exploit archival and historical datasets to their maximum. While they often do not qualify as monitoring datasets in the sense that they are acquired over a period longer than the natural variability, there is, together with modelling efforts, a potential to use them as validation of base-line datasets and the temporal stability of parameterizations of ecosystem connections. Inherent uncertainties can and should be assessed carefully through inclusion of metadata and with the help of scholars from related disciplines.

When discussing the impact of changes on remote locations, we should not forget the role of people living in these areas. It is impressive to see how they have adapted to challenging living conditions over centuries, and it is clear that their adaptability is tremendous but their lifestyle is, nevertheless, vulnerable. We should include people and their vulnerable culture in assessing changes and realize that their heritage can help us to understand thresholds of viable living conditions. Likewise, such physical and immaterial heritage is prone to disappear – whether through chemical decomposition of archaeological remains or through a chang-

ing lifestyle that is in conflict with an established set of values.

DEREK MUIR

My research activities in Arctic and Alpine environments began in the 1980s with measurements of trace organic contaminants, mercury (Hg) and other toxic metals in water, sediments, fish and marine mammals. This work was focused on sources and pathways of contaminants, as well as biomagnification in top predators. At that time, detection of anthropogenic pollutants in remote regions, at levels of concern for human and wildlife exposure, was novel. The issue is now well understood; indeed it is a major part of the science supporting two global treaties on chemicals management, the Stockholm Convention on persistent organic pollutants (POPs)[13] and the Minamata Convention on mercury[14]. With time series of concentrations of POPs and Hg in fish and marine mammals now stretching over 30+ years in the Canadian Arctic at mul-

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[13] http://www.pops.int/

[14] https://www.mercuryconvention.org/

tiple locations, it has become possible to examine these datasets in the context of global change. The concept of "global change" seems like an appropriate way to evaluate the trends that emerge from these time series because it combines the influence of climate change with the response to a variety of anthropogenic stressors[15], which can include shifts in emissions from industrial production and consumer uses of chemicals. Two case studies are provided here which were developed with Dr Günter Köck as part of the Austrian-Canadian cooperation project HIGH-ARCTIC, to illustrate how long-term trends on contaminants in Arctic biota can contribute to understanding some of the emerging challenges John Smol's introductory text refers to.

The influence of climate warming on Lake Hazen in northern Ellesmere Island, the largest lake by volume north of the Arctic Circle (area of 544 km^2 and maximum depth of 267 m), provides an interesting example of what the future may hold for large Arctic lakes with glaciated watersheds.

This lake received an approximately 370% increase in the delivery of glacial meltwater, sediment, organic carbon, nutrients (P and N), and contaminants over the period 2008 to 2015[16, 17] compared to 1996 to 2006, reflecting a ~1 °C relative increase in summer air temperatures. Paleolimnological studies have shown that planktonic *Cyclotella sensu lato* increased in relative abundance and supplanted benthic species by the late 1990s, reflecting longer ice-free periods in the lake[12]. Thus, the food web of Lake Hazen has undergone changes, and the delivery of POPs and Hg, which biomagnify in aquatic food webs, has sharply increased due to remobilization from melting glaciers. The condition (cg/cm^3) of Arctic char (*Salvelinus alpinus*), the only fish species in the lake, is unchanged over the 30-year sampling

period that began in 1990. Mean Hg concentrations in char muscle (length adjusted) declined significantly from 1992 to 2019 (P<0.001; 3.4 %/y) and mean concentrations of total PCBs and total DDT (lipid adjusted) have also declined over the period 2001-2015[18]. These declines were not interrupted by the increased glacial inputs of POPs and Hg in the period 2008-2014. Thus, the story of the char in Lake Hazen is one of resilience to the hydrologic and food web changes. However, the char are responding to global change reflected in declining global atmospheric Hg, and to the phase-out of POPs such as PCBs and DDT, which began in the 1970s/80s in North America, Western Europe, and Japan.

The second case study involves smaller lakes (~ 0.5-1 km^2) without glaciated catchments, which are more typical of the Canadian Arctic Archipelago and coastal regions of Nunavut and Nunavik (Northern Québec). Climate warming is resulting in the thawing of permafrost in

15 Pronk, J. In *The Amsterdam Declaration on Global Change*, In: Challenges of a Changing Earth, Berlin, Heidelberg, 2002. Steffen, W. et al. (Eds). Springer, pp 207-208.

16 Lehnherr, I.; St. Louis, V. L.; Sharp, M., et al. The world's largest High Arctic lake responds rapidly to climate warming. *Nature Communications* **2018,** *9*, 1290. DOI: 10.1038/s41467-018-03685-z.

17 Michelutti, N.; Douglas, M. S. V.; Antoniades, D., et al. Contrasting the ecological effects of decreasing ice cover versus accelerated glacial melt on the High Arctic's largest lake. *Proc.Royal Soc. B: Biol. Sci.* **2020,** *287* (1929), 20201185.

18 Cabrerizo, A.; Muir, D. C. G.; Köck, G., et al. Climatic Influence on Temporal Trends of Polychlorinated Biphenyls and Organochlorine Pesticides in Landlocked Char from Lakes in the Canadian High Arctic. *Environ. Sci. Technol.* **2018,** *52*, 10380–10390.

lake catchments and shorelines with resulting alteration of lake water chemistry, including dramatic increases in turbidity[19]. The effect of permafrost thawing and turbidity on landlocked Arctic char has been part of a long-term study of two lakes at Cape Bounty on Melville Island. Since 2008, one of the lakes (West Lake) has been impacted by catchment permafrost degradation and subaqueous slumps, which together have increased turbidity 50- to 100-fold compared to the nearby East Lake[20]. The condition (cg/cm^3) of Arctic char in turbid West Lake has declined, likely due to the limitation on feeding, since the char are visual predators. In contrast, fish condition has actually increased in East Lake, and fish age-at-size significantly decreased in East Lake between 2008 and 2019, implying faster growth, likely due to greater primary productivity from warmer water temperatures and reduced ice cover. Hg concentrations in

West Lake char increased significantly between 2008 and 2017 (the last year with sufficient data) reflecting increased Hg inputs from catchment permafrost and slumps, while it has declined in East Lake char. Similarly, PCBs in West Lake char have increased likely due to increased mobilization of PCBs, previously deposited from the atmosphere, while they have declined in East Lake. An increase in PCBs was unexpected as declining trends have been seen in landlocked char from other similar sized lakes on Cornwallis Island[13].

These two case studies, using landlocked char as sentinel organisms, provide some insights into what the future may hold for Arctic freshwater ecosystems. Char in both Lake Hazen and East Lake, along with other lakes we have studied on Cornwallis Island[13, 21], are so far unaffected by warming trends and may benefit, at least in the near term, in terms of food availability. However, as permafrost degradation in lake catchments continues, it may influence water

chemistry directly or via related changes, such as creation of shallow lakes and wetlands due to land subsidence[22]. Searun (anadromous) char, which are a highly prized local food across the Inuit Nunangat (homeland of the Inuit in Canada), are likely to be impacted by changes to river and lake turbidity. Increases in turbidity could also impact drinking water quality; all coastal northern communities in Canada depend on nearby lakes for water. Contaminant levels in fish may also rise in locations with extreme permafrost degradation, although, as demonstrated in Lake Hazen, changes in global emissions appear to be more important than effects in the catchments.

DISCUSSION
JOHN P. SMOL

Maybe we can even start by discussing the sources of information that we have. I just recently did a two-hour webinar with an Indigenous group on western science and incorporat-

[19] Lewkowicz, A. G.; Way, R. G. Extremes of summer climate trigger thousands of thermokarst landslides in a High Arctic environment. *Nature Comm.* **2019,** *10,* 1329.

[20] Roberts, K. E.; Lamoureux, S. F.; T.K. Kyser, et al. Climate and permafrost change drives abrupt chemical and ecosystem changes in High Arctic lakes. *Sci. Reports* **2017,** *7,* 13292.

[21] Hudelson, K. E.; Muir, D. C. G.; Drevnick, P. E., et al. Temporal trends, lake-to-lake variation, and climate effects on Arctic char (Salvelinus alpinus) mercury concentrations from six High Arctic lakes in Nunavut, Canada. *Sci.Total Environ.t* **2019,** *678,* 801-812.

[22] Bring, A.; Fedorova, I.; Dibike, Y., et al. Arctic terrestrial hydrology: A synthesis of processes, regional effects, and research challenges. *J. Geophys. Res. Biogeosci.* **2016,** *121* (3), 621-649.

ing Indigenous ways of knowing or Indigenous science. This is something that I see is on the frontline in the Arctic, and I would be curious to find out how much traditional information is used, for example, in European Alpine regions. Maybe I will just start with Derek. I know you work with Indigenous people in the Arctic.

DEREK MUIR

This comes up frequently for scientists in Canada working in this area. It adds a particular aspect to it in terms of food safety and food security, because that side is so important to the people in the Arctic in general. In terms of how we work scientifically and use local knowledge and traditional knowledge, we have found that the local and the traditional knowledge is actually essential for our activity on the ground in the Arctic. That local knowledge is very important, and it is difficult to incorporate it into a scientific paper. In the projects I do in the Arctic, we are involving local people and their knowledge, which really gets the work done and gives us a perspective on changes we only see by coming up there in the summertime. They are watching

and observing through the whole year. The COVID-19 crisis, which prevented scientists from going to the Arctic, was an interesting learning experience. We helped them by sending equipment, but they did all of the work. It was not that long ago that how you did science in the Arctic was some small university group or government group would fly up for three weeks in summer, do the analysis, fly back, do the analysis in their lab, and publish it in their journal; which may have no relevance to people living in these communities. This was a colonial science. But I think that is changing very quickly, at least in Canada. It is definitely changing in other parts of the world too. And there is no reason why the people living there should not be able to do the monitoring themselves.

GÜNTER KÖCK

Derek explained the situation very well in Canada, but the situation over here in Central Europe and all over Europe except the Northern countries, where mercury is an issue, is completely different. There is a traditional knowledge, but only with regards to fishing. How to fish and

where to fish. But there is no traditional knowledge about heavy metal contamination of fish populations. What people are interested in is food safety. In Austria, the concentrations of mercury and heavy metals in fish are much lower than they are in the Arctic.

LINDSEY NICHOLSON

Related to that, I have a question: When considering the Arctic research on mercury and fish, I realise that I do not know what the primary sources of mercury are in the Arctic. Can we mention if it is a long range or say something about that?

DEREK MUIR

For sure the major source to fresh water systems, particularly, is the atmosphere, via long range transport and deposition. Mercury is effectively entering in the snow and rain. There is a gas component of mercury too. And we now know that if you look into a sediment core or an ice core, you can see the history of transport and deposition of mercury in them. That has pretty much been related to the

emissions of coal burning and other combustion sources. Of course, there are geological sources as well. You can pick that up in the same sediment core because of the background in the pre-industrial era.

JOHN P. SMOL

Let me just ask another question on contaminants and then we will move to Jakob and Lindsey. This mercury issue falls under the radar. Sometimes you need a sediment core over the last 50 to 60 years to see that something is happening. Well, there are many more sources and things we do not fully understand. Derek, we have glaciers melting into lakes. One could argue that the glaciers have been this ice box of contaminants, not just water, and now they are being released very quickly. There might also be a dilution effect of the water. And another issue that is happening "under the radar" is permafrost thaw. Do we have some understanding of those two "under the radar" factors, which we often link with climate warming?

DEREK MUIR

In fact, in one study that we are involved in, the glaciers have increased in their flow and brought in much higher sedimentation rates to the lake, but an interesting thing is that we have not found the mercury increasing in the char because of increased mercury deposition. In the case of permafrost there is not as much work, I have to say. This is an area that really needs more study, because permafrost definitely has a reservoir of mercury and other pollutants. We have a study where we are looking at this. But we can not say for sure that is only the permafrost because the other effects, like turbidity, are affecting things like condition of the fish and their food supply. So, it gets complicated in that regard. The historical perspectives from archival material are really important to get a handle on this.

LINDSEY NICHOLSON

I am not a heavy user of historical documents at the moment in my field research, but of course there is a tremendous archive of information here stored by the Austrian Alpine Club. These historical documents can be of great use to look at comparative change. And I think the Austrian Alpine Club is leading a kind of community science effort to measure length changes across as many glaciers in the Alps as they can. But I do have to say something about the release of legacy pollutions from glaciers, because I think it is quite an interesting issue; particularly in the case of those pollutants which were outlawed by the Stockholm convention, the so-called legacy pollutants. And in this case, we need to understand when the melting glaciers surface is exposing the most ice from the 60s/70s, a time period when there was maximum use and deposition of these contaminants in the snow and therefore in the ice. In the case of the European Alps, it seems most likely that the legacy pollutants have been largely released already. Günter, you mentioned that the 80s were maybe the peak of contamination in water. Can you say something about if and how meltout of legacy pollutants contributes to this?

GÜNTER KÖCK

I was talking about industrial effluents. All the major rivers in Austria used to be heavily contaminated by heavy metals like lead and zinc. But there is also one interesting thing which is maybe under the radar, namely nickel. Colleagues from the University of Innsbruck have found increasing concentrations of nickel in high-mountain lakes and in the creeks out there. But the strange thing is that it is not coming from the bed rocks; the concentration in the bed rock is low. Most likely nickel is coming from the permafrost, but we do not know why it is there. So, there are many things to do in the future.

LINDSEY NICHOLSON

This is a fascinating topic. In fact earlier today I was working with one of my collaborators to try and give a report on nickel concentrations in the water supplies of the Alpine huts. Because, again, these levels are not high enough to be dangerous for visitors, but they are elevated; and if you are spending your whole summer with your family living there, you are interested in having more knowledge

about whether there are heavy metals melting out of the permafrost. This is still very much an open question. We have the observations of the rising levels, but the mystery is not solved yet.

JAKOB ABERMANN

If I may pick up the pollution topic. In Greenland it is, of course, very relevant, and I can just add an exotic spice to this by saying that the stories of the Cold War remain in the ice-sheet. They are actually a symbolic manifestation of current climate change, because they were built onto something nobody thought would ever change. And a few decades later people started becoming excited, saying: Well actually, there was a lot of activity on this ice shelf. It was snowed in but now the ice shelf is melting. And quite a lot of researchers are currently involved around these issues. Having a kind of knowledge about human contaminants is something relevant and extremely exciting and important in the end.
I would like to make a small point regarding the use of traditional knowledge. I have little experience with using traditional knowledge because

it is very complicated when it comes to perception, and we all know that tales of snow heights can be very misleading. We can also use it for getting an idea of reliability, because local hunters know exactly where there are reliable fishing grounds. And they would not choose a route that does not work out every year. So, we can use it from a food perspective and we can also use it from a transportation perspective. And finally, I will end with a comment on community involvement. There we have some very successful stories from Greenland, where, for instance, in a very nice project we implemented the transportation of a moving weather station on a vessel that goes in and out of a fjord on a certain day every week. We got a very good new understanding of the climate gradients on a very small scale. And at the same time, people were interested in it because they got a real-time visualization of the current weather.

JOHN P. SMOL

There are always winners and losers. For example, we are seeing the greening of alpine regions, the greening of the Arctic, the plants are mov-

ing further North, animal species are moving further North. We were talking about Arctic char - not too long ago the Arctic char was the only fish in some of these aquatic systems. In some of the Western Canadian Arctic Islands, salmon are now entering the islands. Is this good or bad?

JAKOB ABERMANN

I think it is probably impossible to talk about isolated winners and losers in the interconnected world in which we live. It is possible that people in the Arctic may have some positive development for a time, but they would also suffer from larger scale problems. There is a massive potential in Greenland if you think of climate change. There are important water resources that can be released, and all the transportation gets easier if there is less sea ice. But, on the other hand, that of course creates an increased dependence on these conditions, and we are still struggling with areas where the variability in terms of seasonal changes is enormously high. It is difficult to attribute the current changes to a positive or negative sign. Especially if you think of Arctic infrastructure that is in place, of course, we all agree that we are currently observing very difficult times.

LINDSEY NICHOLSON

I would add, as well, on the planetary scale that we are seeing a strong degradation of biodiversity, and I think the maintenance of biodiversity is important in ecosystem resilience. One other thing that happens with change in the colder parts of our planet is that some species get squished out. There is no niche for them anymore. This is a specific way in which we are eliminating some biodiversity from these particular regions. I suspect, although there will be some differences in the ways that things play out, that overall, we expect to have more vulnerable ecosystems and more people reliant upon them.

JOHN P. SMOL

I was talking to a colleague of mine who has been very closely involved in some of these issues. His advice was quite clear. He said: You can not just get the answers, but you have to talk to the people, whether it is the Indigenous peoples or the people you are dealing with, the local stakeholders. The key is to get there early and find out what are the questions to which they need answers; and once you start answering the questions that are of great concern to them, you have already made a bond. The results are better, not just because they are helping the research get done but because you also have information you would not have otherwise. Be ready to spend some time to find out what are the questions that need answering, and that also contributes to greater "social justice".

JOHN P. SMOL *is Distinguished University Professor of Biology and Environmental Studies at Queen's University (Kingston, Ontario), where he also holds the Canada Research Chair in Environmental Change. He is the current President of the Academy of Science, Royal Society of Canada. Smol has authored over 630 journal publications and chapters since 1980, as well as completing 21 books. Much of his research deals with the long-term impacts of climatic change, acidification, eutrophication, contaminant transport, and other environmental stressors on lakes.*

LINDSEY NICHOLSON *has a BSc in Geography and a PhD in Glaciology. Her research focuses on understanding the relationship between glaciers and climate in order to better understand how the climate system works and how glaciers, and related earth systems, will change in the future. She has worked at research institutions in the UK, Canada, Chile and Austria.*

GÜNTER KÖCK *is a Coordinator of the International Research Programmes of the Austrian Academy of Sciences, Secretary-General of the Austrian National Committee for UNESCO's "Man and the Biosphere (MAB)" Programme and currently Vice-Chair and Rapporteur of the MAB International Coordinating Council. He is also a member of the Scientific Advisory Board of the Hohe Tauern National Park, a delegate to the International Scientific Committee for Alpine Research, associate researcher at the Institute for Interdisciplinary Mountain Research in Innsbruck (Austria) and initiator of the Austrian-Canadian Arctic research cooperation "HighArctic". In this long-term project, led by him and Derek Muir, the effects of climate change on fish from lakes in the Canadian Arctic are studied annually since 1997.*

JAKOB ABERMANN *has been Assistant Professor at the Institute of Geography and Spatial Research in Graz since September 2018. After his PhD in Innsbruck, the meteorologist and glaciologist was a post-doc in Chile and most recently spent 5 years in Greenland, where he worked as a project manager for various monitoring and research projects.*

DEREK MUIR *is a Senior Research Scientist at Environment & Climate Change Canada and holds adjunct professor positions in the School of Environmental Sciences, University of Guelph, and in the Department of Chemistry at the University of Toronto. He leads an environmental chemistry group that studies sources, fate and bioaccumulation of contaminants in the Arctic. He was elected to the Academy of Sciences of the Royal Society of Canada in 2003.*

PANEL 5

FREEDOM OF SPEECH AND FREEDOM OF RESEARCH: CHALLENGES AND RESPONSIBILITIES FOR ACADEMIES AND ACADEMICS IN THE 21ST CENTURY

Chair:
Alice Vadrot, OeAW

Panelists:
Simone Gingrich, OeAW
Christian Sturmbauer, OeAW
Nathalie Des Rosiers, RSC
Len Findlay, RSC

ALICE VADROT

Freedom of speech and freedom of research are two important interrelated principles of vibrant democracies. However, in the past decade, several developments indicate the need to re-think the challenges and responsibilities attached to the objective of coupling "freedom of speech" and "freedom of research". Universities, research centres, and academies increasingly expect scholars to develop public communication of their scholarly work and to engage with stakeholders and policy-makers. Nevertheless, in practice, these duties come with the challenge to disentangle values from facts and reflect on science's role in public and political discourse. Three important developments indicate that academia and academics face specific threats regarding the combination of the responsibility to produce knowledge and "facts" and the duty to inform public discourse and policy-making.

Firstly, the decrease of public trust in science, as exemplified by climate denial, delegitimizes scientists' findings and data sources on the anthropogenic causes of climate change. This example can be extended to other areas of science and policy and is

at the heart of ongoing vaccination debates in the context of COVID-19. Mass movements against science reveal both the politicization of expertise and the strategic de-legitimation of science in public debates.

Secondly, and as became evident during the COVID-19 pandemic, academia and academics face the challenge of adequately informing the public and advising policy-makers in light of scientific uncertainty and rapid scientific developments, which lays experts and science open to attack.

Thirdly, who policy-makers and the media select as a legitimate expert to advise policy-makers and inform public discourse is not always transparent, which leads to the question of who should and who should not be accorded the right to speak on specific issues publicly. There are several examples from both climate change and COVID-19 debates demonstrating the tendency to exclude individual voices from public discourse, which plays into the hands of populists.

In order to address these issues and how they challenge both freedom of speech and freedom of research as core academic values, the aim of this panel is twofold:

Firstly, to discuss these developments and identify related challenges in

light of past and recent experiences and research findings of the involved panelists and their areas of expertise. What are the central challenges that we should address and the responsibilities that we should consider in the future?

Secondly, to discuss these developments in the broader context of how academies can contribute to vibrant democracies by being more explicit and transparent about the relationship between "freedom of speech" and "freedom of research" in the 21st century.

SIMONE GINGRICH

As an interdisciplinary sustainability scientist, I have conducted basic research funded largely by competitive grants from national (Austrian) and international (including Canadian) funding agencies for over fifteen years. Since 2019, when the global climate crisis suddenly became a topic of public interest in the course of the "Fridays for Future" movements, sustainability research, including my own, has significantly gained public attention. My reflections on freedom of speech and freedom of research in Austria are thus informed both

by my role as sustainability scientist and by my personal trajectory as a researcher who has only very recently taken up a tenure-track position at a university in Austria.

Before contemplating some structural limitations to freedom of speech and freedom of research, I want to point out that in Austria, both freedom of speech and freedom of research are, in general, provided. Researchers conducting their academic work or addressing the public do not face threats to their safety, integrity, or jobs, even if the topic of their work is controversial.

As for freedom of research, "excellence" is the funding criterion of major funding agencies, and while the share of projects funded could (and should) be higher, this criterion, in principle, works in many agencies, such as the National Science Fund (FWF), or the European Research Council (ERC). In none of my project proposals have political interventions ever hampered funding. There are, however, some structural limitations.

As sustainability researchers (and many excellent researchers in general) depend on third-party funding for their work, the type of funding available and plausibly achievable significantly shapes the direction of research. Topical calls for proposals (for example in European funding schemes, or by the Austrian Climate Research Panel) nudge research towards specific topics, specifically in the sustainability sciences. This is, of course, politically intended to generate knowledge perceived as essential to solving pressing sustainability challenges. But this nudging also has the effect of shaping the biographies and competences of individual researchers. This does not necessarily prohibit researchers from pursuing also other, more exploratory topics that might yield academic results only in the more distant future. However, given that funding is so limited, rejections are so common, and chances of funding are substantially increased if proposals build on shown experience in a specific field, research diverging from competences once established is, implicitly, discouraged.

So, while researchers are free in their research in principle, the structural conditions of research funding incentivize topical research of immediate academic impact and, vice versa, obstruct to a certain extent the exploration of entirely new grounds. Mechanisms to overcome such "lock-ins" could be, for example, explorative funding formats with low thresholds for submission (e.g. a two-stage funding evaluation) that do not require extensive expertise in the specific field. The 1000 Ideas Programme of the Austrian National Science Fund (FWF) is, in my view, a contribution towards this aim.

Now I turn to freedom of speech. Sustainability sciences, as I stated above, have strong political implications, in the sense that much of the research we conduct challenges many of the social, political and economic fundamentals of current industrialized societies. With the recently increased public awareness of the climate and other sustainability crises, sustainability scientists are more and more regularly invited to engage publicly, at demonstrations, or with media. This is a great achievement, because we see that our research matters. However, for young researchers and researchers in precarious working conditions, as I was for a long time, this may also be disadvantageous, for two major reasons.

Firstly, academic evaluation incentivizes academic publications as well as, to a certain extent, teaching and supervision much more than public engagement. Generating societal impact by addressing the general public

thus competes for time with those activities that may help secure a future university position. Secondly, the higher the degree of precariousness of a young(ish) academic, the more dependent they are on good relationships with potential future employers (which may be very many and very diverse actors). Standing up for contested viewpoints may, however, oppose some of the views of some of these actors, and thus put at risk future employment options for young researchers.

To address these two issues, beyond more funding for researchers reducing the level of precariousness in general, I see two major levers. Firstly, public engagement needs to be included – soon, and effectively – in academic monitoring and rewarding systems. Some activities are currently under way in this direction in Austria, e.g. preparing for formalized monitoring of "third mission" activities at universities. To address the second issue, I believe it might make sense to think about new types of positions accessible to young researchers, similar to the French CNRS research positions. Only a very limited number of such positions are available each year to fairly young post-doc researchers, who, upon commission, are free to conduct the research of their choice at the research institution of their choice, without much monitoring pressure. Such positions could enrich both the scientific and the public debates in Austria.

CHRISTIAN STURMBAUER

Freedom of speech is a fundamental human right and thus should apply to all members of human society. For those of us who live in democratic societies, it is easy to forget that this is not generally the case and that many people still risk their lives when saying what they want to – and often should – say. It is also evident that the privilege of freedom of speech comes with a responsibility for what is being expressed. Freedom of research is another societal achievement that was also long restricted by secular and clerical leaders. Again, the privilege does not apply to all scientists and depends on the political system, and it comes with a responsibility. Academic institutions are the playground where achievements interact and new challenges arise.

Globalization and global digitalization constitute multiple consequences that are catalysts for a series of societal challenges that force us to reconsider these two fundamental human rights and the attached responsibilities, and how we set out our lines of communication. The challenges arising from the COVID-19 pandemic also seem to reinforce issues of communication, so that timely considerations are urgently needed. We pose this question for scientists and academic institutions, since expert knowledge comes with responsibility for society. The increasing scarcity of raw materials, unfair trade, climate change, biodiversity crisis and now COVID-19, are issues that can no longer be ignored by the scientific community.

In challenging times, we scientists increasingly engage with societal and political decision-makers. In order to meet those timely challenges, we must ask whether the traditional rules of academic integrity are still adequate. How can we make fact-based scientific statements under considerable levels of uncertainty? More precisely, how can we communicate those facts that are sufficiently scientifically based in a wider context of unknown parameters, or variables that generate uncertainty? But there are also other questions: How can we defend science-based "facts" against fake facts spread by hostile lobbies

or enthusiastic followers of pseudo-scientific influencers? In summary, there are several urgent issues to be discussed in order to develop a timely code of conduct.

Our panel plans to raise the question of how academics – more precisely scientific scholars – and academies should meet the challenges of utilizing and respecting freedom of speech and freedom of research, two core achievements of vibrant democracies. Questions to be asked are:

What are the degrees of freedom, what the ethical limits for communication with the general public and/or stakeholders?

How does scientific communication fit into the new reality of social networks?

Which style of communication is adequate for scientists? How can we achieve a common language keeping scientific rigor? Is the "Assessment Report" style the only adequate?

Are we allowed to act within the real-life lobby landscape of political conduct, or must scientists stay outside as neutral parties? Are there circumstances in which scientists can or even should overstep this boundary? How can science counteract fake facts and conspiracy theories?

Concerning my first 3 questions:
Scientists are good at communicating within their own scientific community; this line ofcommunication is what has been part of their academic education.

Scientists are often not so good in communicating with the general public, i.e. non-scientists, politicians, etc. But this is exactly the line of communication that we scientists increasingly need to engage, as expert knowledge comes with a responsibility to society.

Communicating fact-based scientific knowledge to the general public and various stakeholders needs scientific rigor and clear language: The style that has been developed for policy-makers is the "Assessment Style"-language, in which statements are weighed in (1) an evidence scale concerning scientific backup, and (2) a correspondence scale. Both these dimensions merge into a scale of confidence. So, scientists have developed a new line of communication with the general public and various stakeholders including policy-makers. What I am unsure about is to what extent this has spread in the scientific community and whether it is already an official code of conduct.

Concerning my two last questions:
There are other important challenges: How can we defend established science-based "facts" against fake facts spread by pseudoscientific influencers among enthusiastic followers, or by hostile lobbies who strategically seed distrust to push their own agenda? To communicate successfully under hostile or ignorant circumstances is clearly a new challenge in times of social networking. COVID-19 has shown how efficient these activities are, how fast fake facts spread and thus how dangerous strategic disinformation is. This urgently requires a strategy and a new code of conduct. Maybe we even need a new institution providing independent fact-checks for the general public? This actually might be a responsibility for an Academy of Sciences.

NATHALIE DES ROSIERS

We are invited to reflect on the politicization of expertise and the difficulty of protecting the integrity of scientific inquiry processes in times of polarized debates. We are invited to reflect particularly on the role of academics in the context of the responses to COVID- 19, climate change and

the debates within universities about free speech.

I want to begin by reflecting on the premises of the existing commitments to freedom of speech and freedom of research to suggest that current debates about equality are healthy because they challenge whether current powers (including within academia) have done enough to respond to the profound inequalities of our time.

Secondly, the protection of academic research requires constant self-assessment and invites all academic institutions (including and particularly academies) to reflect on their role in challenging power structures. Academic freedom is generally well protected in universities in Canada and, although tensions arise, the main threats continue to be lack of funding and isolation from decision-making circles: Knowledge does not always reach decision-makers. Although the Canadian responses to COVID-19 and climate change are generally informed by ''science'', the public demand for certainty risks undermining respect for science. This may be because of a lack of scientific literacy, but it stems from great fears about the human capacity to respond to life-threatening challenges. The response from academies should be about strengthening their institutional capacity to produce and disseminate good science and respond and challenge bad one.

Freedom of Research and Freedom of Speech in Academia

Recently, in Canada, several provincial premiers have suggested that there is not sufficient protection for freedom of speech in universities. For example, Québec Premier François Legault suggested that anti-racist advocates have gone too far and that universities were not standing up to them. Ontario had earlier demanded that universities adopt "free speech" policies. The binary debate over free speech often appears ill-conceived because it is presented as a freedom vs. equality debate. In one corner, free speech supporters maintain the right to say whatever they believe without any consequences, a right without responsibility. In the other corner, are those who claim a right to break their silence, a demand for inclusivity in discourse, and that there ought to be greater limits to offensive speech: the right to offend vs. the right of the offended to respond.

It is a mistake to remain in the binary opposition between pro-freedom of speech and the pro-limitations on speech. Democracies need both freedom and equality. We ought not to choose one over the other. It is absolutely necessary to confront the reality of inequality in order to preserve free speech.

Democracies rely on people's commitment to a few abstract ideals: the rule of law, the presumption of innocence, the importance of free exchange of ideas, and equality before the law, among others. At times, the gap between the abstract principles and reality tests the commitment. This is one of those times.

When a Black man is shot seven times in the back while being arrested, it is difficult to continue to believe in his right to the presumption of innocence. You cannot be presumed innocent when you are dead. Your right to trial does not matter. The claims for equality must be addressed, otherwise, the commitment to the principles is threatened. Unequal speech is not free; it is inherently limited, because it belongs only to a few people. Challenges in universities are about the whiteness of the curriculum and barriers to entry for BIPOC students and scholars. These claims have to be heard. To ignore these claims by labelling the problem as an issue of the academic freedom of a few professors is not helpful.

Freedom without equality limits the essence of the good life and self-fulfilment to the very few. Freedom without equality leads to the ability to hold the mike without any accountability. It preserves islands of freedom and limits entry. Because we have limited our conception of freedom of expression to only the right to speak, and not the right to have access to a place to speak, we have trouble responding to the current crisis. Our limited concept of free speech means that some voices are heard and others not. Inequality inherently limits speech when it silences voices. Indeed, in Canada, the case law supports the view that the constitutional protection is about preventing limits to the expression and not ensuring access to the possibility of expression itself: "freedom of expression contained in section 2(b) prohibits gags but does not compel the distribution of megaphones"[1].

We know that equality without freedom is not much better: it presents current ideas as orthodoxies, stifles evolution, and leads to the inability

of new thinkers to challenge current claims. Every movement for change struggles with the demand for loyalty and allegiance to the fight. But the challenges within equality-seeking groups need to happen. The demands for equality are always evolving: New words are created to describe the reality of discrimination and oppression. Freedom of speech is necessary in order to preserve the ability to debate how to fight for equality. Equality without liberty represses the very idea of change, evolution and progress over the long term.

Academics often provide the language to define inequality, and the evidence to support it. Freedom of research is essential to the ability to challenge the current power distribution.

If we situate this debate in a larger framework, we could argue that our intellectual heritage has been obsessed with civil and political rights, and often relegated socio-economic rights to the aspirational level. This was a mistake. It posited free speech as the most important right, and put equality beyond formal equality, second. This has caused the current tensions.

Socio-economic rights such as the right to housing, to medical treatment, to a minimum livelihood are

designed to remedy systemic inequalities. The failure to protect socio-economic rights forcefully in our constitutional framework prevents us from addressing meaningfully inequality. The abstract promises of our democracy, like the presumption of innocence and equality before the law, cannot be sustained when the lived reality is too removed from lofty pronouncements. By failing to embrace socio- economic rights as essential to our democracy, we are stuck in binary oppositions between freedom and equality and are threatening the ability to sustain a vigorous protection of freedom of speech.

This applies to universities and academia as well. The failure to ensure access for all delegitimizes the enterprise and threatens the protection of academic freedom. If academic freedom protects only the voice of a few, mostly from the elites, it will fail to justify its protection. Therefore, the challenge for academies and academics is to continue to analyze and reflect on what are the barriers to access to knowledge, to universities, and to academia, and to remedy them. We should cooperate among ourselves to ensure that we develop the best practices of access for traditionally excluded communities and of inclu-

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1   Haig c. Canada, [1993] 2 R.C.S. 995, 1035 (j. L'Heureux-Dubé); UAlberta Pro-Life c. Governors of the University of Alberta, 2020 ABCA 1 (CanLII)

sive excellence. It is the only way to sustain, morally and ethically, continued protection for academic freedom.

More speech, not less; more science, not less

Climate change deniers, anti-maskers, anti-vaccination proponents are inevitable. There will always be people who gain popularity by spreading falsehoods. It is part of the human story.

The question is how to effectively counteract falsehood. Truth, facts and evidence matter. One should not despair of the human capacity of seeking them. Indeed, the COVID-19 experience has demonstrated that the more cooperation within the scientific community, the greater the success in limiting the spread of falsehoods. More science creates the ability to develop scientific consensus and resolve disputes over discrepancies or disagreements. Robust scientific processes are essential to the pursuit of the truth and they are essential to freedom of speech, which encompasses access to information.

A few final thoughts about where academies should go:

- Academies must be present to respond to falsehoods. Ideally, we would create services of social me-

dia watchers who would have the time and the energy to respond *with facts* to challenge climate deniers, anti-maskers, anti-vaccination proponents: scientific fact-checkers, in a way.

- Blaming the public for the existence of climate change deniers, anti-maskers and anti-vaccination proponents is not helpful. Fears explain most human reactions to bad news; how to better respond to such fears, how to understand fear is part of what we must study. In itself, it should continue to be the object of research.

- Some scientists have created a business model for themselves, and almost a personality cult, by publicizing wrong facts, and spreading bad research; the academies must respond to these breach of ethics. It should have stronger methods to deal with unethical behavior. Some scientists are at the mercy of funding that places them in a conflict of interests: It is incumbent on the academies to attend to such institutional problems.

- Academics must continue to learn to speak to the public in a way that is correct, and accessible. This should be viewed as a duty and be recognized. It must be bound by

ethical rules: Universities should value, measure and evaluate such production.

In conclusion, this is a unique opportunity for the academic sector to take a leadership role. More than ever, the world needs good science and good scientists. This leadership role must take stock of unequal access to academia and must address it. It must also strengthen its capacity as an institution to deal with bad behavior and bad actors who spread and publicize bad science for their personal gain. It must also continue to support rigorous research processes, defend them and argue for more. It must continue to reflect on its own processes in a critical fashion, and it must do so in an accessible and transparent way, as we are doing here today in this session.

LEN FINDLAY

Here, I restrict myself to key claims and questions related to our topic. I write from a Canadian perspective while recognizing that different countries have different traditions and laws determining how academic work is conceived, undertaken, and assessed.

My Pre-Positioning

"Sapere aude!" "Dare to know, to be sapient." The citation of Horace's famous tag by Kant in his 1784 essay, "What is Enlightenment?", points to the efficacy of bold formulations such as we sorely need today. Like the "parrhesia" rediscovered and re-inflected by Foucault, Kant's re-purposing of an ancient Roman tutelary verse-letter attests to the persistence over time and space of basic questions about relations between knowledge and wisdom, and the need for courage rather than circumspection or self-censorship in this private pursuit. Kant is cagier on the institutional and more public disclosure of the findings of intellectual inquiry, for reasons rehearsed rigorously yet discreetly in face of royal censorship in *The Conflict of the Faculties* (1798). While intimations of the Anthropocene increase ever more menacingly, we need to be as rigorous as, but less circumspect, than Kant. We need also to know how to dare (*Audere sape!*), heeding Kant's exhortation while also re-working Greta Thunberg's accusation at the UN in New York – "How dare you?" – as "**How dare *we not* dare to know, and to act upon that knowing in disciplinary, institutional, policy, and public settings?**"

Moreover, this obligation to advocate on the basis of knowledge is not an unwelcome interruption or contamination of the life of pure mind or of Weberian "value-free" science undertaken in the '**innocent' interstice** between value-marked proposing of inquiry and the interested application of its investigative and experimental outcomes. Advocacy is not a partisan indulgence or guild arrogance; it is part of our job: a way of translating our expertise to better nourish trust in our capacities and integrity; a way to build more appropriate linkages with, e.g. citizen scientists as fellow stakeholders in the informing and reforming of insatiably extractive democracies and increasingly "illiberal" ones like Hungary and Poland; and it is a necessary refusal of the delusional detachment of the "free-floating intellectual." No more reminder is needed on this point, I hope, than what happened when Victor Frankenstein arrived at Ingolstadt to advance his studies on the nature of life. It was his wilful disconnection from social ties and values that enabled the ensuing travesty and tragedy.

And one may retain the role of advocate even when there are no certain "facts" to appeal to in service of one's values. The uncertainty of science requires moderation of its hubris but also reclamation of its history and affirmation of the continuing need for its existence. "The market" may claim to fear and avoid uncertainty while inducing and profiting from it, but its 'logic' is dubious, its claims of 'efficiency' impoverished and impoverishing. Appeals to "creative destruction" simply do not suffice, especially when bereft, as they usually are, of Schumpeter's learned derivations of "schöpferische Vernichtung / Zerstörung" from Marx and Sombart. We need, urgently post-COVID-19, a shift back from the neoliberal to the liberal arts, and forward from global supply chains and the predictable flow of poisons and prosperity to planetary systems and sustainable, circular economies. Otherwise, we will be rewriting another famous saying, this time in a very bad way. For Rousseau, "Man is born free; and everywhere he is in chains." For those Trumpians striving for "America uncanceled", "Man is born white and libertarian; and everywhere he is in supply chains." Angry nativists everywhere must be educated in the public uses of reason, asap!

Freedom of Speech, Freedom of Research, and Academic Freedom

From my Canadian point of view, our panel's title and some of its framing risk conflating and reducing several discrete forms of academic expression with their own distinctive conventions and protections, reducing them to free speech as understood and practiced in the society that hosts the institution. However, free speech overlaps with, but is not identical to, the communicative freedoms re-earned and redeployed continuously by academics in an ever-changing mediascape. The academy best deals with relations between the law of the land and the traditions and values of researchers and teachers by initiating or responding to free speech claims on academic ground and via academic freedom and the *sui generis* features that help enable it: namely, institutional autonomy and collegial governance in academic matters (all three usually guaranteed in universities' founding charters ratified by the Canadian provinces or territories in which they are located and whose governments are their principal funders). **Do not allow the Trojan Horse of free speech onto campus,** except as the inalienable civic supplement to faculty and student rights and responsibilities. Go out to meet it only when other interests try to weaponize it, putting the academy on the defensive and hence more prone to self-censorship, to apparent confusion and intolerance in matters of great intellectual and democratic moment, and to the inadvertent legitimation of irrationality as creative scepticism.

Canada's legislation regarding free speech is permissive. There is a fair amount of jurisprudence on the matter with more likely coming regarding social media. Academic expression is permissive too, but there is comparatively little jurisprudence relating to it. Courts are reluctant to interfere in communication in academic settings, trusting instead to the self-regulating capacities of autonomous institutions with their own collegially determined and applied conventions and standards. Reassuringly, there is general judicial recognition of the importance of academic freedom to excellence in research and teaching, and to the effective modelling of the importance of evidence-based analysis and debate to democratic societies. The Supreme Court of Canada has recognized that academic staff should pursue knowledge and disseminate the results in a "**free and fearless**" way. Disciplinary norms play a role in protecting and guiding academic communication, as do collective agreements for the mostly unionized academic staff associations across Canada, but academic freedom is enjoyed by **individuals** in undertaking academic work. It is done with the expectation of rebuttal, not fear of reprisal.

The greatest dangers to academic freedom – hence to the excellence and integrity of research, teaching, and community service – currently come from the increased casualization and imminent **Uberization** of academic labour; increased corporate influence allowing donors to act like owners; and reduction of public funding of public post-secondary systems. Another challenge, in a good way, is to decolonize our institutions through **Indigenization**. In this process, the most responsible stewards of what biodiversity remains, spurning the celerity of "fast capital" for the timespan of the seven generations, can enhance the dialogic competencies of research, replenishing the meanings of the human and "all our relations" in order to avoid further zoonotic and other retaliation from a badly wounded planet.

Academic speech and civic free speech can then speak more to the Anthropocenic purpose, in well-researched acts of democratic affirmation rather than demagogic deformation. Meanwhile, perhaps we could all think about what Gustave Klimt would do today, if commissioned to complete another set of *Faculty Paintings,* and where they would leave *Kunstfreiheit, Wissenschaftsfreiheit, Akademische Freiheit,* and us!

DISCUSSION
SIMONE GINGRICH

I really enjoyed Christian's input and I would like to offer a thought on your comment about the challenge of having scientific facts stand against the active fake facts. I fully agree, and I have also thought of this problem as a political problem and a problem that the media needs to solve. For a long time, there was this kind of he said/she said journalism, in particular reporting on climate change. This needs to be changed by journalists, and I see movement in that direction in Austria. But of course, I am very much with you that we, the researchers, also need to find a language and a way to deal with this challenge. We

can not wait for the media to solve it on their own.

LEN FINDLAY

You are talking about the common curse of false "balance": equal time for each denier and each proponent. The resulting picture is often very misleading. The question is rather: Is there a legitimation crisis in science? And I would suggest to you that from my experience in Canada there is not. One of the astonishing effects of the pandemic is that Canadians have been exposed every single day to a huge roster of senior and junior scientists ably analyzing the shifting picture and the competing possibilities of the pandemic. And they were Canadians of all ethnicities with all sorts of immigrant-intonations and accents.

ALICE VADROT

How easy is it to distinguish between facts and values?

LEN FINDLAY

I think that one of the answers is there are disciplinary conventions and they vary from discipline to discipline. But rather than get too defensive, I want the academy to recover its swagger. I want it to be out there, confident in the clarity and the cogency of its own voices. We have little to apologize for. We have much to mourn in terms of underfunding and insecurities of various sorts that diminish the capacity of the scientific community and the academy generally. But we also receive gifts of nonsense like "alternative facts." So, one of the ways in which we face the discursive and representational challenge of populist accusation is to examine that language, to put it under the microscope, to ask 'where is your authority?' Sometimes it is very difficult or impossible to separate fact from value.

CHRISTIAN STURMBAUER

I might elaborate a bit more on this and make it a little bit more focused on what the new problem is. One of the increasingly important challenges is that we need to recognize and

to deal with fake facts. There are a few new promising developments that I observed recently, for example in the news broadcasts of the Austrian Broadcasting Company. The news report is immediately followed by an interview with a scientist who acts as a fact checker and gives founded background information on the issues. I feel this is a very important function which needs to be more and more fulfilled in our society. One might actually ask whether a new institution is needed for providing independent fact checks for the general public. The Austrian Academy of Sciences and the Royal Society in Canada would be the kind of institutions that have the standing and the broadness of expertise to make these kinds of statements. And I would also remind the audience that this was happening in Germany just recently with the COVID-19 problematics. There were official statements from the scientists of the Leopoldina, who made their statements on particular problems. This has not been the case in Austria. There have always been individual scientists that have been recruited by governmental institutions.

SIMONE GINGRICH

This is a very good observation and comment. Coming back to Alice's question, I observe the problem the other way around, where the facts that I see in my research and that are also well known become political. What is factual in my work induces a radical political implication when you think about what it would really mean to decarbonize as quickly as we would need to achieve the targets of the Paris agreement. These are radical shifts in the fundamentals of our societies that would be required. It is a learning process: how to communicate the importance and severity of the challenges that are ahead in a way that it is competitive with what media are used to telling.

CHRISTIAN STURMBAUER

I would like to pick a question to read to the audience. "These researchers do not even agree among themselves", is what one often hears from politicians these days when they are asking why researchers do not have more to say in pandemic policy decisions. Academia always is facing the double challenge of protecting internal academic pluralism while simultaneously communicating established academic insights and assessments to the outside and the public. That challenge has become even more intense during this pandemic crisis. From your own experience, do you have good suggestions how to solve this in better ways today?"

This is a very important question raised by Mr. Gingrich. We do have responsibility, but we also have rules about how we as scientists should communicate, and we should make it clear that scientists are here to deliver balanced news about the state of the art in particular fields, and answers, possibly partial ones, to specific questions. We are not the ones that make the decisions; this is the job of the politicians. So, when we make statements, we should be very careful of how we make the statement in order not to prejudice any decision to be taken. A good suggestion would be this kind of assessment-style language, which I have already mentioned. This is one way we scientists can phrase all these issues in view of the relevant degree of uncertainty.

ALICE VADROT

There is one comment and question by Verena Winiwarter from the Austrian Academy of Sciences. "The ability to fight for truth in what I perceive is a real legitimation crisis in Europe, in particular under right-wing governments, is made more difficult by what Simone Gingrich mentioned: the structural limits to freedom of research, in particular for precariously employed researchers. In my opinion, freedom is at risk if grant money from large grants controlled by very few governmentally controlled funding agencies becomes the dominant source of funding, because the funders shape what is possible; claiming that they are objective of course." Verena Winiwarter's question is whether the panelists can think of other structural measures to counteract the structural challenges, other than what Simone mentioned. The third mission inclusions into grant evaluations are extremely competitive and therefore not a solution. What could we ask for? Which measures would the other panelists suggest to counteract these structural challenges?

SIMONE GINGRICH

It has been discussed that the processes of peer review are at their limit. There are ideas about lotteries for project grants. Of course, this will not solve the problem, you need a plurality of solutions, because funding will not immediately increase. I think we have to be much more innovative in terms of how funds are allocated. And I agree with Verena, that there is a cluster of power which decides on these grants.

LEN FINDLAY

It seems to me that sometimes it is more than a nudge. Sometimes it is directing people in particular kinds of ways. Our senior administration, including those who are the stewards of the research enterprises, have to work with colleagues to develop the language that separates the autonomy and integrity of the investigator from the ill-concealed desires of the funder. Across Canada, as a response to these very genuine and in fact worsening difficulties of funding, there is now problematic subservience to external agendas. There is a whole range of policies that protect

students and the rights to publish and so on: a new regime that is supposed to be protective of the independence and integrity of scientists. The real problem is in the application of these policies, that is, in making them work to protect young scientists. The undermining of trust is part of the larger problem that Alice identified for us. In Canada, every year the Canadian Association of University Teachers commissions a survey which identifies where academics fit on the trust calculus or index. And academics come way up there. Well above politicians. So, people do trust us, though not uncritically, and we need to bear that in mind.

CHRISTIAN STURMBAUER

There is another question that I would like to read from the audience: "I would also disagree that there is a general decrease of trust towards science. We should refrain from deducing such a statement from the certainly undeniable increase of science-hostile views in social media. Those who are the loudest do not automatically represent the majority. Simply speaking, scientists also have the responsibility and obligation to

continuously justify their methodologies and findings in front of non-scientists. Scientists are privileged, after all, in that they usually process the arguments and knowledge base better. So there should be nothing to fear in conquering general ignorance and persuading those who disbelieve. Public engagement and third mission activities in general need to drastically increase among scientists even if it would result in a general decrease in scientific activities. Freedom of science and justification of science do not compete but complement each other. Scientific institutions and funding agencies need to guarantee necessary support, and publication mania needs to stop."

I would like to pick up one particular issue: Those who are the loudest do not automatically represent the majority. We scientists should not be naïve. If there are new means of communication around the lines of ethics, I think we should remind the public that there are ethical rules of how to communicate. What Verena called the truth is something that we never can know for absolute, but of course, it is something that we can support with a lot of evidence. We scientists should be realistic to some extent and actively use the new terms

and develop rules how to counteract these activities. It is very important that we learn to do this.

ALICE VADROT

As we are almost at the end of our session, I would propose that we have a final round of short statements by each panelist.

LEN FINDLAY

I would just like to say that this conversation, this initiative contributes to this idea of joint work. Nathalie's paper points to the urgency of collaboration rather than competition as one of the ways of pushing into the right ethical direction. I see new forms of collaboration that are cross-disciplinary, cross-institutional, cross academies – that is, that we try to leverage the individual forms of authority and reputation, in particular of the national academies. And if you put those two worlds together, they start fighting with each other and that is very good. One of the things I found the most interesting, was how it kept me awake at night thinking about this panel and wondering what everyone

would say. And I think that one of the great outcomes is a minor mountain of unfinished business that we need to pursue further. So, I will think about how we can develop some of these and around particular initiatives, e.g. the 1000 Ideas Programme. We need to get more information shared, so we can share these practices.

CHRISTIAN STURMBAUER

I also enjoyed Nathalie's statement very much as it was highly complementary to what I have said before. You mentioned the fear that arises from the problems that we are facing. That is certainly something that we should not forget. We should continue to take this problem seriously as scientists and as members of society in the academic environment.

SIMONE GINGRICH

I agree with the minor mountain of unfinished business. One issue that I particularly think about now is the question about fact checking, how that could be pursued and how our academies could contribute to that. Thank you for the inspiring discussion.

NATHALIE DES ROSIERS

May I conclude. One other idea I had as we were preparing: academies speaking to each other, as Len says, more cooperation. In the academic world we often want evaluations from other universities coming to evaluate our programs, coming to evaluate the way in which we do business. We may want to imagine similar cooperations between academies. Could we have the Austrian Academy coming to help us, to look a bit critically at the way in which the Canadian Royal Society is operating in Canada, sharing best practices? It may also enhance our capacity to have credibility if we can say that we have just had an outsider examine and help us define our best practices.

ALICE VADROT

Thank you very much for these concluding thoughts. I think the co-operation of the two academies is a fantastic idea. I very much enjoyed the debate and I think there is a lot of food for thought now for the panelists and the audience.

ALICE VADROT *is Associate Professor for International Relations with a focus on Environmental Politics at the Department of Political Science of the University of Vienna and Visiting Research Fellow at the Centre for Science and Policy (CSaP) of the University of Cambridge. She is the principle investigator of the ERC research project MARIPOLDATA, which is developing and applying a new methodological approach for grounding the analysis of science-policy interrelations in the area of marine biodiversity politics in empirical research. Since 2019, Vadrot has been a member of the Young Academy of the ÖAW and a member of the board of the Austrian Biodiversity Council.*

SIMONE GINGRICH *is Assistant Professor in Social Ecology, focusing on long-term socio-ecological research, at the Institute of Social Ecology, Department of Economics and Social Sciences at BOKU, and is a member of the Young Academy at the Austrian Academy of Sciences. Her research addresses sustainability challenges from a long-term perspective, focusing on industrialization processes in land and energy use. She currently leads the ERC starting grant project "Hidden Emissions of Forest Transitions" (ERC-2017-StG-757995).*

CHRISTIAN STURMBAUER *is Professor of Zoology and Evolutionary Biology at the University of Graz and a Corresponding Member of the Austrian Academy of Sciences. The study of adaptive evolution using cichlid fishes as model system and the documentation of the Central European biodiversity are his focus of research, manifesting in a leading role in the project initiative Austrian Barcode of Life (ABOL), his membership in the Commission for Interdisciplinary Ecological Studies of the Austrian Academy of Sciences, and his involvement in the editorial boards of Bioinformatics and Ecology Series of the OEAW, Hydrobiologia and Journal of Zoological Systematics and Evolutionary Research.*

NATHALIE DES ROSIERS *has been Principal of Massey College since 2019 and is a Visiting Professor at the University of Toronto and Trinity College. She was previously Dean of Law (Common Law) (2013–2016), (Civil Law) (2004–2008) at the University of Ottawa, General Counsel for the Canadian Civil Liberties Association (2009-2013), President of the Law Commission of Canada (2000–2004), and a of Provincial Parliament (2016–2019).*

LEN FINDLAY *is Distinguished Professor Emeritus from the University of Saskatchewan, which lies in Treaty Six territory and the traditional homelands of the Métis. A former President of Academy One (Arts and Humanities) of the Royal Society of Canada, and two-time Chair of the Academic Freedom and Tenure Committee of the Canadian Association of University Teachers, he is currently a Senior Fellow at the Ryerson University Centre for Free Expression. He has published extensively on nineteenth-century European literary and cultural topics, and more recently on decolonizing Canadian universities and the Humanities in particular.*

PANEL 6
HEALTHY SOCIETIES

Chair:
Candace I. J. Nykiforuk, RSC

Panelists:
Marc Luy, OeAW
Judit Simon, OeAW
Sue Horton, RSC

CANDACE I. J. NYKIFORUK

Over the last four decades, Healthy Cities programs have substantively changed our understanding of population health systems' interconnections with socio-economic and political systems as well as fostering dedicated attention to the impacts of infrastructure and built form on human health. Collectively, this body of work has turned our attention to the broader issue of healthy societies – transcending the health sector to consider economic viability, ecological sustainability, urban development and renewal, community resiliency, and social vitality as integrated, inseparable forces in a complex system. A healthy societies platform requires continuing and nuanced systems-oriented data to report impacts on the population, including marginalized or vulnerable groups. Equity and citizen participation must also be considered by privileging community voice and knowledge to reveal the intricacies of social and structural determinants of health. Much of the focus on healthy societies is underscored by needs generated by the rapid population growth of urban centres. However, populations living in rural and remote areas are often at the front lines of accelerated and extreme environmental outcomes of climate change and face profound and inequitable health outcomes as a consequence. Indigenous peoples and communities comprise a large proportion of the population living outside of urban areas and are faced with a greater proportion of these health and environmental outcomes. Moreover, Indigenous communities have generations of knowledge about and stewardship of their lands and their communities' health. The health of our societies is a critical determinant of our ability to effectively respond to the rapidly escalating physical, mental, societal, and environmental health issues facing us today. In this session, we will consider the following:

- What makes a society healthy or unhealthy?
- How do we measure societal health, and more importantly, how should this information be used and by whom?
- What knowledge, skills, and experiences will be needed by the next generation to foster and sustain healthy societies in the face of the rapid technological, economic, and environmental change occurring globally?

MARC LUY

Measurement and Improvement of Population Health: Thoughts of a Demographer

The role of health for ageing societies
The demographic developments of industrialized societies are characterized by aging of the populations, i.e. the absolute and relative increase of the older compared to the younger population.[1] This process is caused both by fertility rates remaining constantly below replacement level (i.e. an average number of about 2.1 children per woman) and by decreasing mortality rates among the old and the oldest-old.[2] Demographic projections reveal that population aging is unavoidable in any population in

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[1] Golini, A. 2003. "Current demographic setting and the future of aging. The experience of some European countries." *Genus* 59(1):15-49. Rechel, B., E. Grundy, J.-M. Robine, J. Cylus, J.P. Mackenbach, C. Knai, and M. McKee. 2013. "Ageing in the European Union." *The Lancet* 381(9874):1312-1322.

[2] More details can be found e.g. in: Goldstein, J.R. 2009. "How populations age." Pp. 7-18 in *International handbook of population aging*, edited by P. Uhlenberg. Dordrecht: Springer.

the industrialized world.[3] The increases in the number and proportion of people in the higher and highest age groups are already yielding many societal consequences of immediate relevance, including increasing demand for social services as well as raised requirements for the health care and social security systems.[4] These developments are generally referred to as "demographic change" and they are the demographic phenomena that currently receive much attention from scientists, policy-makers and the general public.[5] The extent of these consequences depends strongly on the health status of the populations.[6] As stated by the WHO,

"better health is central to human happiness and well-being. It also makes an important contribution to economic progress, as healthy populations live longer, are more productive, and save more".[7] Improving citizens' health is therefore one of the most important and effective ways to reduce the burdens of demographic aging.[8] Accordingly, promoting good health was defined as an integral part of 'Europe 2020', the EU's 10-year economic-growth strategy. This ambitious program launched the pilot "European Innovation Partnership on Active and Healthy Ageing" (EIP AHA) in 2011.[9] Its headline target has been to increase the average healthy lifespan in the EU by two years by

2020. These additional life years are considered the essential basis (1) to enable older citizens to lead healthy, active and independent lives, (2) to improve the sustainability and efficiency of social and healthcare systems, and (3) to boost and improve the competitiveness of the markets for innovative products and services that respond to the aging challenge both at EU and global levels.

Measurement of population health
Assessing the progress of such public health programs toward their targets requires an appropriate and reliable indicator for tracking the levels and trends of population health. This indicator should have a distinct meaning with clear interpretation, and it should be available for all (or at least many) populations and subpopulations. Demographers use such an indicator for the assessment of a population's health status: life years. The advantage of the corresponding indicators such as "life expectancy" (LE) or "healthy life years" (HLY) is that they can be easily understood and interpreted by everyone: scientists, policy-makers, public health officials, and also laypeople. Consider, e.g., two populations, A and B, of which population A lives 5 years longer than pop-

[3] Lutz, W., W. Sanderson, and S. Scherbov. 2008. "The coming acceleration of global population ageing." *Nature* 451(Feb 7):716-719. Powell, J.L. 2010. "The power of global ageing." Ageing International 35(1):1-14.

[4] Harper, S. 2000. "Ageing 2000 - questions for the 21st century." *Ageing & Society* 20(1):111-122.

[5] Luy, M., P. Flandorfer, and P. Di Giulio. 2015. "Ageing in an aged society: experiences and attitudes of Catholic order members towards population ageing and older people." *Ageing & Society* 35(1):1-36.

[6] Prince, M.J., F. Wu, Y. Guo, L.M. Gutierrez Robledo, M. O'Donnell, R. Sullivan, and S. Yusuf. 2015. "The burden of disease in older people and implications for health pol-

icy and practice." *The Lancet* 385(9967):549-562. Steptoe, A., A. Deaton, and A. A. Stone. 2015. "Subjective wellbeing, health, and ageing." *The Lancet* 385(9968):640-648.

[7] Source: http://www.who.int/hdp/en; accessed: 19.01.2016

[8] Beard, J. R. and D. E. Bloom. 2015. "Towards a comprehensive public health response to population ageing." *The Lancet* 385(9968):658-661.

[9] Details can be found on the website of the European Commission, Department "Health and Food Safety" (SANTE) at https://ec.europa.eu/health/other-pages/basic-page/europe-2020-healthier-eu_en; accessed: 03.03.2022

ulation B. This number does not only reflect that mortality is obviously lower in population A. Even more importantly, the extent of the difference also has a very clear and tangible meaning: five life years is really a lot. The clear and real-life meaning of the life years indicator also helps to transfer the insights from scientific work to policy makers, public health officials and the general public. According to my experience, the most effective way is the presentation of differentials in LE and HLY between specific subpopulations, such as differences between women and men, geographical units, education levels or income groups. First, dividing the total population into subpopulations brings the abstract indicator values closer to the individual. This makes people more directly concerned about their own health and encourages them to think about the differentials and the causes behind them. This is relevant because several studies reveal that most of the differentials in health and longevity are due to factors directly or indirectly influenced by human action.[10] Ralph L. Keeney even con-

cluded that "personal decisions are the leading cause of death".[11] His analysis of premature mortality in the United States indicated that over a million of the 2.4 million deaths in 2000 could be attributed to personal decisions – such as smoking, diet, exercise, criminality, alcohol and drug consumption – and could have been avoided if readily available alternative choices were made. Furthermore, he estimated that almost half of deaths due to heart disease and two-thirds of cancer deaths are attributable to personal decisions, and that around 95% of the deaths attributable to personal decisions result in the death of the individual making the decision. Our own studies on members of Catholic religious orders provide further indicators for the major impact of human influence on health and longevity. We found, for instance,

that monks live up to 5 years longer and are healthier than their secular counterparts.[12]

It must be noted, however, that the measurement of HLY is much more complex than commonly recognized. Several indicators have been developed for this purpose. The general – and technically correct – understanding of the HLY indicator is that it simply extends the average LE by one dimension through the separation of life years into those spent in good and poor health. However, the devil is in the detail: Indicators for HLY are extremely sensitive to certain methodological assumptions and features. This is a debilitating problem that has been described in several studies.[13] In contrast to mortality, health is multi-dimensional and difficult to measure, and the common

[10] Christensen, K. and A. M. Herskind. 2007. "Genetic factors associated with individual life duration: heritability." Pp. 237-250 in

Human longevity, individual life duration, and the growth of the oldest-old population, edited by J.-M. Robine, E. M. Crimmins, S. Horiuchi, and Y. Zeng. Dordrecht: Springer. Christensen, K., N. V. Holm, M. McGue, L. Corder, and J. W. Vaupel. 1999. "A Danish population-based twin study on general health in the elderly." *Journal of Aging and Health* 11(1):49-64.

[11] Keeney, R. L. 2008. "Personal Decisions Are the Leading Cause of Death." *Operations Research* 56(6):1335-1347.

[12] Luy, M. 2003. "Causes of male excess mortality: insights from cloistered populations." *Population and Development Review* 29(4):647-676. Luy, M. 2016. "The impact of biological factors on sex differences in life expectancy: insights gained from a natural experiment." Pp. 17-46 in *Gender-specific life expectancy in Europe 1850-2010*, edited by M. Dinges and A. Weigl. Stuttgart: Steiner.

[13] E.g. Robine, J. M. and K. Ritchie. 1991. "Healthy life expectancy: evaluation of global indicator of change in population health." *British Medical Journal* 302(6774):457-460.

method of quantifying individuals' health statuses by self-assessment on the basis of specific survey questions is ambiguous.[14] As a consequence, statistics on levels and trends of HLY vary significantly depending on the underlying survey data and health indicators.[15] Thus, it is important to take these technical and methodological sensitivities of the HLY indicators into account and to decide carefully which one to use in practical application.

Improvement of population health
I see the key for the development of measures to improve the health of a population – and thus to increase the number of HLY – in the identification of subpopulations with poor health status and high mortality. It is often overlooked that the average number of total or healthy life years results

from the health and mortality of different subpopulations.[16] The identification of the most relevant subpopulations and their characteristics helps to understand why a certain population lives longer and stays healthier than another one, or why the number of total respective healthy life years changes between periods. The next steps would then be the identification of the most important risk factors and the development of strategies to reach these subpopulations in order to provide them with information and to help them improve their health.
In this context, it is an important observation that most health differentials within and between populations are caused primarily by social factors.[17]

Notably, empirical evidence shows that socio-economic status (SES) is not just one of the strongest determinants of morbidity and mortality.[18] Its association with health and longevity has also persisted over centuries, despite essential changes in the diseases and risk factors that have been assumed to be its central drivers.[19] Bruce G. Link and Jo Phelan explain this phenomenon with their "theory of fundamental social causes". The theory states, in a nutshell, that the enduring association between SES and health results because SES embodies an array of flexibly usable resources – such as money, knowledge, prestige, power, and beneficial social connections – that protect health no matter what mechanisms are relevant at any given time.[20] These flexible resources operate at both individual and context levels. At the individual level, they can be conceptualized as "cause of

[14] McHorney, C. A. and A. R. Tarlov. 1995. "Individual-patient monitoring in clinical practice: are available health status surveys adequate?" *Quality of Life Research* 4(4):293-307

[15] See e.g. Jagger, C., C. Weston, E. Cambois, H. Van Oyen, W. Nusselder, G. Doblhammer, J. Rychtarikova, J.-M. Robine, et al. 2011. "Inequalities in health expectancies at older ages in the European Union: findings from the Survey of Health and Retirement in Europe (SHARE)." *Journal of Epidemiology and Community Health* 65(11):1030-1035.

[16] Luy, M. and K. Gast. 2014. "Do women live longer or do men die earlier? Reflections on the causes of sex differences in life expectancy." *Gerontology* 60(2):143-153.

[17] Bucciardini, R., R. M. Ferrelli, A. M. Giammarioli, E. Bortolin, E. Fanales Belasio, B. Mattioli, C. Donfrancesco, M. Sabbatucci, R. Pasetto, A. Colucci, R. Mancinelli, L. Palmieri, P. De Castro, L. Sampaolo, S. Gaudi, L. Falzano, S. Morelli, T. Grassi, S. Buttò, A. Luzi, and W. Ricciardi. 2019. "Health inequalities: a Research Positioning Exercise at the National Institute of Health, Italy." *European Journal of Public Health* 29(5):943-947. Marmot, M. 2005. "Social determinants of health inequalities." *The Lancet* 365(9464):1099-1104.

[18] Mirowsky, J. and C. E. Ross. 2003. *Education, Social Status, and Health.* New York: Aldine de Gruyter.

[19] Antonovsky, A. 1967. "Social class, life expectancy and overall mortality." *The Milbank Memorial Fund Quarterly* 45(2):31-73.

[20] Link, B. G. and J. Phelan. 1995. "Social conditions as fundamental causes of disease." *Journal of Health and Social Behavior* 35(Extra Issue):80-94.

causes" or "risk of risks" that shape individual health behaviors by influencing whether people know about, have access to, can afford and are motivated to engage in health-enhancing lifestyles to avoid risks and adopt protective strategies.[21] At the contextual level, they provide "add on" benefits through shaping access to advantaged neighbourhoods, high-status occupations, and social networks that vary significantly in associated profiles of risk and protective factors.[22] Consequently, the theory states, whenever gains are made in the ability to control

disease, people who are advantaged with respect to these resources will, on average, benefit more from new knowledge and health-enhancing capabilities.[23]

Consistent with predictions derived from the fundamental social causes' explanation are the findings that the SES-mortality association was significantly stronger for highly preventable causes of death such as lung or colorectal cancer,[24] than for less preventable causes of death such as brain or ovarian cancer.[25] Even the finding mentioned above – that monks live, on average, several years longer than men from the worldly population – seems largely rooted in social causes. We found that this difference in LE is not a consequence of a general sur-

vival advantage of monks. In fact, it is predominantly the men with low education levels who profit from living in a religious community and are the main cause for the overall high LE of Catholic monks.[26] Based on the knowledge obtained so far, I believe that Link and Phelan's theory of fundamental social causes provides a very useful framework to identify the decisive risk groups and to develop the most effective strategies to reach people and help them improve their health. Regarding the latter, it would be a critical step to reduce the inequalities in access to (flexible) resources in the Link and Phelan sense.

Summary of the main points
To conclude, the key inputs I would like to bring to the discussion of healthy societies are:

1. The number of total and healthy life years is a very useful indicator for tracking the levels and trends of a population's health status;

21 Current examples for such health-enhancing lifestyles include knowing about and asking for beneficial health procedures, quitting smoking, getting flu and Covid-19 shots, wearing seat belts and driving a car with airbags, eating fruits and vegetables, exercising regularly, and taking restful vacations.

22 More details and discussion of the implications can be found in: Link, B.G. 2008. "Epidemiological Sociology and the Social Shaping of Population Health." *Journal of Health and Social Behavior* 49(4): 367-384. Link, B.G. and J.C. Phelan. 1996. "Understanding sociodemographic differences in health-the role of fundamental social causes." *American Journal of Public Health* 86(4):471-473. Phelan, J.C., B.G. Link, and P. Tehranifar. 2010. "Social Conditions as Fundamental Causes of Health Inequalities: Theory, Evidence, and Policy Implications." *Journal of Health and Social Behavior* 51(1 suppl):S28-S40.

23 Phelan, J.C .and B.G. Link. 2005. "Controlling disease and creating disparities: a fundamental cause perspective." *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 60(Special Issue 2):S27-S33.

24 Singh, G.K., B.A. Miller, and B.F. Hankey. 2002. "Changing Area Socioeconomic Patterns in U.S. Cancer Mortality, 1950–1998: Part II – Lung and Colorectal Cancers." *Journal of the National Cancer Institute* 94(12):916-925.

25 Phelan, J.C. and B.G. Link. 2005. "Controlling disease and creating disparities: a fundamental cause perspective." *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 60(Special Issue 2):S27-S33.

26 Luy, M., C. Wegner-Siegmundt, and P. Di Giulio. 2021. "Direct effect of education on mortality: insights from the Cloister Study." in *The male-female health-mortality paradox: research report of the ERC project HEMOX*, edited by M. Luy. Vienna: Austrian Academy of Sciences:112-132.

2. The definition of health and the quality of the health data have a significant impact on the indicators and thus, the decision for a particular indicator must be thoroughly thought through;

3. The average health state of a population is the product of specific subpopulations' health conditions: the so-called risk groups;

4. To improve the health status of a population it is critical to know its risk groups and their specific risk factors;

5. The theory of fundamental social causes of health inequalities might be the key to decreasing inequalities in health and thus improving the health of populations.

JUDIT SIMON

Healthy Societies from a Health Economics/Public Health Perspective

Statement: Numbers do not lie but can be easily misrepresented or misinterpreted, and are often not comparable between settings. The devil, as always, is in the detail.

Determinants of health: What makes a society healthy or unhealthy?

Total governmental health expenditure is on average 7% of the gross domestic product (GDP) in the EU, with Austria leading the ranking list with 8.3% (Eurostat, 2019). It is the second-highest general governmental expenditure function in the EU-27 (983 billion), following social protection and ahead of general public services and education (Eurostat, 2019). Average government spending on public health services, however, remained at a bare 0.2% of GDP in the EU and in Austria prior to the COVID-19 pandemic (Eurostat, 2019) despite growing evidence of the cost-effectiveness of these interventions and the notion that the performance of a given health care system is only one determinant of population health.

In their seminal work, Dahlgren and Whitehead established that health is determined by a complex interaction between individual characteristics, lifestyle, living and working conditions including health care, and broader socio-economic, cultural and physical environmental factors. The actual contribution of health care to overall population health outcomes was estimated to lie between 15-43%.[27] Meanwhile, the contribution of medical care (preventative and curative) to the 30-year life expectancy increase over the 20th century was calculated at approximately 5 years, with the remaining impact attributed to broader non-health care determinants of health including public health measures such as improvements in motor-vehicle safety, better sanitation, water hygiene, housing, etc.[28]

Large inequalities, however, exist within countries by gender and socio-economic status. Men can expect to live on average 5.2 years less than women in the EU (78 vs. 84 years) and 4.7 years less in Austria (79 vs. 84 years). In addition, men with low

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[27] Dahlgren G, Whitehead M (1993). Tackling inequalities in health: what can we learn from what has been tried? Working paper prepared for the King's Fund International Seminar on Tackling Inequalities in Health, September 1993, Ditchley Park, Oxfordshire. London, King's Fund, accessible in: Dahlgren G, Whitehead M. (2007) European strategies for tackling social inequities in health: Levelling up Part 2. Copenhagen: WHO Regional office for Europe: http://www.euro.who.int/data/assets/pdf_file/0018/103824/E89384.pdf

[28] Bunker JP, Frazier HS, Mosteller F. Improving health: measuring effects of medical care. Milbank Quarterly 1994;72:225-58.

educational background can expect to live about 7 years less than those with higher education in the EU. This educational gap is considerably lower at 3 years for women.

Measurement: How is a society measured as healthy or unhealthy?

How can we best measure and monitor the health of a society and the performance of a health care system in order to identify opportunities for improvement and achieve equity and sustainability? According to Peric et al. (2018), there are over 2000 health and health system indicators available within the EU with major overlaps, consolidation opportunities, gaps and measurement issues, especially in the areas of efficiency.[29] I would like to highlight the importance of definitions and the correct understanding of the evaluative space considered in a given indicator.

Health status:

The main causes of deaths in the EU and Austria are cardiovascular dis-

eases and cancer, accounting for approximately 60% of all deaths. The most common basic measurement of population health in this respect is **mortality rate** (number of deaths that occur in a population during a period of time divided by the size of the population).

Life expectancy (the measure of how long on average a person of a given age can expect to live, if current death rates do not change) at birth currently lies at 81 years for the EU and 82 years for Austria. It has increased by 12 years over the past 50 years (a very similar value to Canada, OECD). Most of these gains have been made after the age of 65, namely an additional 6.7 years for women and 6.6 years for men in Austria. The gender gap in life expectancy is, therefore, narrowing in older age groupes. The additional 4.7 years of life expectancy at birth for women reduces to 3.1 years by the age of 65.

But extra years of life are not necessarily lived in good health. So, does a similar picture emerge when considering not just mortality but also morbidity? **Healthy life expectancy (HALE)** where life expectancy is adjusted by the disability and function limitations experienced in a given society, still leaves Austria performing

above the OECD and EU averages, but with a smaller 2 HALEs gender gap at birth (average: 70.9 HALEs, men: 69.9 HALEs vs. women: 71.9 HALEs; OECD, 2016). **Healthy life years (HLYs)** or disability-free life expectancy, the number of years that a person is expected to live without an activity limitation (disability) however, shows a very different picture. In 2018, Austria performed below the EU average of 64.2 HLYs for women (AT: 57.0 HLYs) and below the EU average of 63.7 HLYs (AT: 56.8 HLYs) for men, albeit indicating a much smaller gender gap (AT: 0.2 HLYs) in this metric (Eurostat, 2018). **Disability-adjusted life year (DALY)** is a universal metric that not only allows population health to be compared across countries and over time, but also tells us about the contribution of different health conditions to disease burden. It was developed by the World Bank and the World Health Organisation for the 1993 World Development Report.[30] DALYs express the total amount of healthy life lost which equal the sum of years

[29] Perić N, Hofmarcher-Holzhacker M M, Simon J (2018): Headline indicators for monitoring the performance of health systems: Findings from the european Health Systems_Indicator (euHS_I) survey. Archives of Public Health. 76: 32. doi: 10.1186/s13690- 018-0278-0.

[30] World Bank. 1993. World Development Report 1993: Investing in Health. New York: Oxford University Press. © World Bank. https://openknowledge.worldbank.org/handle/10986/5976

of life lost (YLLs) due to premature death and years lived with disability (YLDs). As shown by the Global Burden of Disease Study (2017), cardiovascular diseases and neoplasms cause the largest disease burden not only in terms of YLLs but also in terms of total DALYs in the EU and in Austria. On the other hand, while not responsible for significant portions of deaths and YLLs, mental disorders and musculoskeletal disorders represent a large burden in terms of YLDs and overall DALYs.[31]

According to the WHO, however, "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). In light of this, is it sufficient to measure 'only' mortality and morbidity when looking at health?

Quality of life (QoL) and well-being: **Quality of life (QoL)** is the degree to which an individual is healthy, comfortable, and able to participate in or enjoy life events (Britannica). It is influenced by complex socio-economic, environmental and cultural factors, as well as by health status. In reference to the WHOQOL instrument (WHO, 1998), it measures "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns". **Health-related QoL (HRQoL)** is an evaluation of QoL dimensions related to health status. Its measurement is now well-established in outcome, quality of care, cost-utility and health technology assessments with numerous different generic or disease-specific patient-reported outcome measure (PROM) questionnaires in use. One of the most common generic PROMs which measure HRQoL is the Euro-QoL EQ-5D questionnaire; which still lacks a national level valuation set for Austria, with the consequent lack of nationally representative evaluation, or cross-country and over time comparison opportunities.

A related, but somewhat differing concept is **well-being**. Standard indicators of well-being include wealth, employment, education, recreation and leisure, social situation, security, religion, the environment and physical and mental health. Austria performs well in many aspects of well-being relative to most other countries in the *OECD Better Life Index*. It ranks above the OECD average in income and wealth, jobs and earnings, housing, health status, subjective well-being, personal security, social connections, environmental quality, and education and skills. It is below average on work-life balance and civic engagement.[32] Currently Austria is 5th among all countries in terms of the overall *Quality of Life Index*[33] and Vienna is the number 1 city in terms of quality of living in the world.[34]

The **capability approach** was proposed as an alternative to the standard utilitarian approach to quality of life measurement with an added focus on what individuals are able to be and do in their lives. In other words, what they are free to do and capable of, rather than their actual

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[31] GBD Study (2017a) Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet (2017) Volume 390, Issue 10100, 16–22 September 2017, Pages 1211-1259.

[32] http://www.oecdbetterlifeindex.org/countries/austria/

[33] https://www.numbeo.com/quality-of-life/rankings_by_country.jsp

[34] https://mobilityexchange.mercer.com/Insights/quality-of-living-rankings

functioning.[35] Among other things, it inspired the creation of the UN's *Human Development Index*, a measure of human development capturing capabilities in health, education, and income. It also led to the establishment of Nussbaum's ten central human capabilities.[36] Since it also provides a richer evaluative space than those of the other metrics mentioned before, it has also been operationalized for self-reported well-being measurement, for example for mental health research.[37]

Future: What will make a society healthy or unhealthy?

With the ongoing and expected long-term health, economic and social consequences of the COVID-19 pandemic, beside effectiveness, efficiency and equity, more focus on resilience at the individual, system, population and international levels will become crucial. The optimal levels of globalization and digitalization will have to be reassessed. In order to be able to evaluate better the health impact of policy measures, safe, well-linked health data spaces that go beyond health care will have to be established alongside harmonized, international indicators of well-being. More emphasis on tackling health, socio-economic and geographical inequalities, especially via investing more in health literacy, prevention, mental health, education and the development of rural areas will be needed. In Austria, special focus may be given to the QoL of older women.

[35] Sen A. Commodities and capabilities: Elsevier Science Pub. Co.: Amsterdam, New York U.S.A; 1985. Nussbaum and Sen. The Quality of Life. Oxford: Clarendon Press; 1993.

[36] Nussbaum M. CAPABILITIES AS FUNDAMENTAL ENTITLEMENTS: SEN AND SOCIAL JUSTICE. Feminist Economics. 2003;9(2-3):33-59.

[37] Simon J, Anand P, Gray A, Rugkåsa J, Yeeles K, and Burns T (2013) Operationalising the capability approach for outcome measurement in mental health research. Social Science & Medicine, 98:187–196. doi: 10.1016/j.socscimed.2013.09.019.

SUE HORTON

Healthy Societies: COVID-19, great leveller or great revealer?

What makes a society healthy or unhealthy is a very big question, and I propose to address a related (but narrower) question, namely what societal conditions lead to the population being healthy, along with some observations about appropriate data and measurement. To do this topic justice, I will not attempt to address the question of the knowledge, skills and experience of the next generation.

Up until a year ago I would have said that Canada had a fairly healthy society – with one major exception being the health of the Indigenous population. After all, according to the World Bank World Data, life expectancy at birth in 2018 was 82 (the same as Austria) and only just behind Hong Kong (85), Japan and Switzerland (84) and half a dozen other high-income countries (83) (I have excluded some small islands and enclaves here). This is in contrast to the United States, which spends more per capita on health than any of these countries but has a life expectancy of only 79. Canada takes pride in its single-payer health system and the fact that, unlike the US and the UK for example, a parallel private health system is not permitted.

However, that view changed with the advent of COVID-19, which laid bare several unhealthy aspects of society in Canada. The province of Ontario declared a state of emergency due to the pandemic on March 17, 2020, less than a week after the first death in the province. Later that

same month, when the Prime Minister of the UK was diagnosed with the virus, Michael Gove, a Cabinet Minister, stated that "The fact that both the prime minister and the health secretary have contracted the virus is a reminder that the virus does not discriminate".[38] But there was a subsequent backlash to the idea that COVID-19 was a "great leveller" and others[39] have termed it instead a "greater revealer" of inequalities affecting health.

I will briefly discuss two of these inequalities, namely health inequalities by ethnicity, and resources for health by age. These inequalities also raise provocative questions about whether measurement can help or harm.

Canada has not collected race-based data (in health or in other areas) in the way the US has. It has been argued that collecting and publishing race-based data can fuel prejudice (e.g. race-based crime statistics). One could argue that the availability of race-based data in the US has not been associated with narrowing racial inequalities but has been associated instead with highly contested policies such as affirmative action. In Canada, by contrast, policies have been fuzzier (emphasizing multiculturalism and diversity training as opposed to quotas). However, when it became evident how great the disparities were in infection and mortality rates from COVID-19 in the US and the UK, this was a wake-up call to Canada to consider collecting individual data by race for health. The lack of such data meant that disparities during the pandemic could only be identified with more blunt tools.

In the US and the UK, it is possible to see shocking differences in hospitalization and mortality for COVID-19 by race. In the US, hospitalization rates for black and African-Americans have been 2.9 times those of white non-Hispanic Americans and deaths 1.9 times as high; while the comparable statistics for Hispanics compared to white non-Hispanics were 3.2 times and 2.3 times respec-tively.[40] In England, mortality rates for ethnic minority groups (primarily black and South Asian Britons) have been twice as high as for white Britons, even controlling for age, sex, education, housing and area deprivation. Similarly, these ethnic groups were more likely to need intensive care and invasive ventilation even when admitted with initially similar levels of disease.[41]

In Canada, the same analysis is not possible as individuals' health data are not collected in conjunction with race/ethnicity. Data does show, however, that when (using quartiles) those neighbourhoods with the highest proportion of visible minorities are compared to those with the lowest, death rates were three times higher within the two largest provinces (Quebec and Ontario), and ten

[38] Milne A. UK under fire for suggesting coronavirus 'great leveller'. Reuters Big Story, April 9, 2020. https://www.reuters.com/article/us-health-coronavirus-leveller-trfn-idUSKCN21R30P (Accessed March 4, 2021).

[39] Corak M. COVIDE-19 is not the great leveller, it's the great revealer. Broadbent Institute, New and Blogs, April 14, 2020. https://www.broadbentinstitute.ca/milescorak/covid_19_is_not_the_great_leveller_it_s_the_great_revealer (Accessed March 2, 2021).

[40] Centers for Disease Control. Risk for COVID-19 Infection, Hospitalization, and Death by Race/Ethnicity. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html (Accessed March 3, 2022).

[41] Razai MS, Kankam HKN, Majeed A, Esmail A, Williams DR. Mitigating ethnic disparities in covid-19 and beyond. BMJ 2021;372:m4921 Reuters, 2020.

times higher in British Columbia.[42] Results were similar when the analysis was undertaken within two major cities, Toronto and Montreal. However (unlike the UK and US data) it is not possible to disentangle poverty and occupational characteristics and separate these from other ethnicity-based factors.

At the same time, collecting race-based health data can be a double-edged sword. During the SARS outbreak in 2003, restaurants offering Chinese food were disproportionately affected in cities in Canada, as they were (erroneously) stigmatized as sources of disease. Singh (2020) writes about racist stereotypes and the tragic death of Brian Sinclair in Winnipeg in 2008. Mr. Sinclair wheeled himself into an emergency room for assistance with his catheter bag, while suffering a bladder infection. He was perceived as "an Indigenous man who hospital staff believed was there 'to watch TV', appeared 'intoxicated' and was simply 'sleep-

ing it off' "[43] and did not receive attention for 34 hours, by which time he was dead.

As one commentator puts it: "(T)he goal, though, must be more sophisticated than gathering numbers and spitting them out. After all, the United States has a whole lot of race-based health data, yet outcomes for Black, Latino and other racialized communities are often abysmal. If such information is going to be meaningful, it matters who collects it, how they collect it, and what happens next."[44]

Canada has resisted publishing crime statistics by race, perhaps fearing some of the adverse outcomes in the US. Examples are the gunshot deaths in 2020 during the pandemic of Andre Hill in Ohio in December 2020 (who happened to emerge from a garage carrying a cell phone when the police responded to a non-emergen-

cy call by a neighbour of a car being left running in the street), of Ahmaud Arbery who was jogging in his own neighbourhood in a small town in Georgia, and of Rayshard Brook who was sitting in a parked car at a drive-in restaurant in Atlanta, Georgia. They were all black men. Publishing statistics on crime and incarceration rates by race, and thus creating stereotypes, without addressing biases in sentencing and policing, would seem to support Balkissoon's point.

A second area of inequality revealed by the pandemic has been the vulnerability of the older population. This has been true across countries, despite often large differences in the institutional arrangements to support seniors. Canada stood out (in a bad way) in the first wave of the pandemic in a report published in June 2020.[45] At that time, 80% of the COVID deaths in Canada were in long-term care (LTC) – as compared to 38% on average in other OECD countries (and only 19% in Austria).

42 Subedi R, Greenberg L, Turcotte M. COVID-19 mortality rates in Canada's ethno-cultural neighbourhoods. Stat COVID-19: Data to insights for a better Canada. Available at https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00079-eng.htm (Accessed March 2, 2021).

43 Singh, S. Collecting race-based data during pandemic may fuel dangerous prejudices. The Conversation, Monday June 22, 2020. https://theconversation.com/collecting-race-based-data-during-coronavirus-pandemic-may-fuel-dangerous-prejudices-137284 (Accessed March 2, 2021).

44 Balkissoon, D. Opinion: Canada's dire need for better race-based data> Maclean's (magazine) June 8, 2020. https://www.macleans.ca/opinion/canadas-dire-need-for-better-race-based-data/ (Accessed March 2, 2021).

45 Canadian Institute for Health Information (CIHI). Pandemic Experience in the Long-Term Care Sector: How Does Canada Compare With Other Countries? June 2020. https://www.cihi.ca/sites/default/files/document/covid-19-rapid-response-long-term-care-snapshot-en.pdf (Accessed March 2, 2021).

According to CIHI, Canada had substantially weaker policies to prevent outbreaks in long-term care, while Austria had amongst the strongest policies across the OECD (visitor restrictions, guidance, hazard pay for sector workers, surge staffing, PPE funding, LTC isolation wards, LTC infection control training, broad LTC testing, and rapid response and control and prevention teams, none of which were in place in Canada).

This inequality is documented in another way from much more recent data on differences in COVID-19 deaths by sex, from Global Health 50/50 (February 22, 2021).[46] Out of 103 countries reporting data, in only 13 were more than half of the deaths women (men are generally more susceptible). Canada is one of those 13, related to the very high proportion of the deaths during the pandemic being in LTC. The military were called in at the worst points to LTC care homes in Quebec and Ontario, the two largest provinces, to cope with shameful situations.

Some of the criticism has focused on issues such as ownership of the homes, pointing to discrepancies in mortality rates between for-profit, not-for-profit, and municipally owned homes, often without taking full account of the differences (that for-profit facilities often operate older homes, with multiple room occupancy, which are far worse in terms of transmission). I have seen grant proposals which, for example, request funding for doing sophisticated geospatial tracking of care workers, to document how they move between different homes to work. But all this analysis seems to me to gloss over the underlying issues summarized in a Royal Society of Canada Policy Briefing.

We do not need sophisticated geolocational data to know that the staff in the long-term care sector are underpaid and undervalued. The proportion of unregulated staff, i.e., care aides as opposed to qualified nurses, has risen over time.[47] Providing part-time employment in order to evade the additional costs of benefits required for full-time workers inevita-

bly leads to staff holding down multiple jobs both in other homes and in front-line work in the community. Improving pay and working conditions in this sector to attract more workers is essential (but cannot be done at the expense of the home care sector, which aims to keep vulnerable seniors and others in their homes as long as possible). Without training more staff, efforts to recruit more LTC staff will simply transfer the shortages and problems elsewhere.

The two final recommendations (out of nine) of the Royal Society's Brief relate to measurement. I cannot express this better than the report does: "….Data collected must include resident quality of care, resident quality of life, resident and family experiences, and quality of work life for staff. Data must be collected using validated, appropriate tools, such as tools suitable for residents with moderate to severe dementia. Captured data must address disparities and compounding vulnerabilities among both residents and staff, such as race, ethnicity, language, gender identity, guardianship status, socioeconomic status, religion, physical or intellectual disability status, and trauma history screening.

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46   Global Health 5050. The COVID-19 Sex-Disaggregated Data Tracker Last Update February 22, 2021. https://globalhealth5050.org/the-sex-gender-and-covid-19-project/the-data-tracker/ (Accessed March 3, 2022).

47   Estabrooks CA, Straus S, Flood, CM, Keefe J, Armstrong P, Donner G, Boscart V, Ducharme F, Silvius J, Wolfson M. *Restoring trust: COVID-19 and the future of long-term care.* Royal Society of Canada. 2020.

Data collection must be transparent and at arm's length from the LTC sector and governments…{Governments} must engage the LTC sector in this process, particularly the people receiving care, their families, managers and care providers."

In my own research area of global health, "decolonizing global health" and "decolonizing humanitarian aid" are recent buzzwords, accelerated undoubtedly by international travel restrictions – and by the inequities revealed in "vaccine nationalism". Although the pandemic has emphasized the need for complicated, integrated, real-time datasets (for modelling the epidemiological impacts of policy options for example), perhaps another enduring need that has been revealed is decolonizing data, as the two examples discussed above suggest.

CANDACE I. J. NYKIFORUK

Now I am inviting each of our panelists to offer a very brief closing thought: *When you picture a 'healthy society', what do you see in your mind's eye? What is it that you are imagining?* For me, I want to see a future where children can grow up feeling con-

nected to their community, have access to the things they need, and can experience joy, well-being and high quality of life. As a public health researcher and a public health professional I ask myself, "what I can do as a healthy societies researcher to offer that future to them".

MARC LUY

I guess that the stress factor is maybe the number two risk factor after smoking for overall health and longevity. In our order members study we noticed that male religious, above all, profit from monastic life. Their life expectancy is up to 5 years higher than that of men in the general population. I wanted to understand the reason for their high life expectancy, and so I went to the monasteries and asked the brothers themselves how they explain why they live so much longer. Interestingly, no matter who I spoke to, they all said first that it is the clearly structured daily life, i.e., the daily routine that they all have. Some of them mentioned explicitly that they are very happy that they do not have to organize every day anew. The second reason most of them mentioned was that their lives are not

disrupted by retirement. For them it was very important that they always have a meaningful function in society, so that they feel part of society. I think that these aspects of monastic life can also be understood as effects of stress. A healthy society, according to me, is one where the stress level is becoming lower and lower, and thus significantly reduced.

SUE HORTON

The one thing about the life in the monastery is that you have no stress because you have no children. So, I think that it can not be an ideal society. I cannot fully answer your question. But what I can tell you is short-term. The lessons I would draw about healthiness are related to COVID-19. The three good things are that people have stayed more at their home and have spent more time walking and in nature. That is something I would like to continue. We have all spent more time with our families and less with our friends. The third thing is work-life balance. When working at home, we all tend to overwork and work too many hours and not take breaks, but the ability to work from home is something that we will con-

tinue after the pandemic. What are the bad things that we should avoid? We have learned how bad inequality is and how it strongly impacts on mortality. We have learned that there are bad sides of globalization. The fact that we have been so reliant on these national supply chains – that is a big lesson that we have all learned. And vaccine nationalism. Let us hope we have less of that in the future.

JUDIT SIMON

For myself, I would have one wish beyond all that has been already said. The recent advancements in digitalization are wonderful. We have learned how good it is that we can talk to each other in this session across oceans and continents. We can have distance learning even during the pandemic so that children and students are able to continue with their education; we can conduct our work from home, or use digital e-health options. Nevertheless, I really hope that at some point personal human contact and human touch will become part of our everyday lives again. My short-, mid- and long-term hopes would be that digitalization will not take over fully and our

children will experience the type of human interactions we experienced when we were younger.

CANDACE I. J. NYKIFORUK *is Professor and Associate Dean in the School of Public Health at the University of Alberta, the Director of the Centre for Healthy Communities at the School of Public Health, and a member of the RSC. Her research examines how community environment – social, political, built, and natural factors – interplay with people's circumstances to impact individual and societal well-being. Her partner-based work has directly informed policy in municipal and provincial governments, school communities, and national NGO strategic directions. Dr. Nykiforuk holds numerous awards for innovative social science and public health engaged scholarship.*

MARC LUY *is head of the research group "Health and Longevity" at the Vienna Institute of Demography of the Austrian Academy of Sciences. His research is focused on differentials in health and longevity. The corresponding topics involve differences between specific subpopulations – such as women and men or socioeconomic status groups – as well as differences between countries or smaller regional units with a special focus on differences between and within Eastern and Western Europe.*

JUDIT SIMON *is a health economist and public health physician. She is currently Professor and Head of the Department of Health Economics (DHE) and Deputy Head of the Center for Public Health at the Medical University of Vienna in Austria, and Head of Health Economics at the LBI Applied Diagnostics. Previously she held positions at the LSE, UCL and University of Oxford in the UK where she remains Visiting Professor and Research Associate. Her methodological and applied research focuses on the operationalization of the capability approach for outcome measurement, cost, economic burden and cost-effectiveness analyses, and health services and systems research with special focus on mental health, public health and personalized medicine.*

SUE HORTON *is University Research Chair in Global Health Economics at University of Waterloo, and Fellow of the Royal Society of Canada and also of the Canadian Academy of Health Sciences. Her work has focused on the economics of nutrition in low- and middle-income countries, and more recently on the economics of cancer and of diagnostics in that same group of countries.*

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