Universities as the fifth power?

Opportunities, Risks and Strategies

Ana Mari Cauce, Yves Flückiger, Bert van der Zwaan (Eds)

glion COLLOQUIUM
The Future of the Research University
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The Glion Colloquium

Founded in 1998 by Luc E. Weber (University of Geneva), Werner Z. Hirsch (UC Los Angeles) and James J. Duderstadt (University of Michigan), the Colloquium's objective is to allow leaders of renowned universities to meet and discuss major questions related to the development of science and Higher Education, as well as governance and leadership of research-intensive universities. The Colloquiums are organized biennially by a small, independent Association based in Geneva, Switzerland, and by an international programme Committee designated every other year to set up the programme and invite participants. Various forms of financial support and funding have been found over the years – research and cultural international foundations, global corporations, Swiss universities, as well as the Swiss State Secretariat for education, research and innovation, have participated.

Altogether, 200 different leading figures from higher education worldwide – active or recently retired university leaders – as well as politicians and business leaders, have participated in one or more Colloquiums. The Glion Colloquium helps shape the future of our universities in order to improve their ability to serve society to the fullest. A unique concept, free of any influence, where the presentation and discussion of ideas take centre stage. At past gatherings, participants have considered topics such as the rapidly changing nature of research universities, university governance, the interaction between universities and society, collaboration between universities and business, the globalization of higher education and how universities prepare to address the changes and challenges characterizing our times. The contributions that participants are invited to write beforehand openly reflect their views and experience in order to stimulate discussion. The Glion Colloquium sessions are held in camera, to guarantee open and genuine exchange.

To secure the broadest possible international dissemination of the analysis and recommendations coming out of the contributions and discussions, the revised contributions are published 6-8 months after each Colloquium in a volume which is freely distributed to numerous university leaders worldwide and also sold commercially. This book is the 13th in the series. Nine of them were published by ECONOMICA in Paris. From the 11th book onwards, the organizing Committee has opted for self-publication and a print-on-demand solution, most recently in collaboration with the Swiss self-publishing online platform ISCA in Geneva (www.isca-livres.ch). Searchable PDFs of the books and of each of their composing chapters are freely available one year after publication on the Glion Colloquium's website (www.glion.org) and on the Open Archives of the University of Geneva (https://archive-ouverte.unige.ch/).

Volumes

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2. *Governance in Higher Education, The University in a State of Flux*, Werner Z. Hirsch and Luc E. Weber, eds, Economica, Paris, London, Geneva (2001)
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4. *Reinventing the Research University*, Luc E. Weber and James J. Duderstadt, eds, Economica, Paris, London, Geneva (2004)
5. *Universities and Business: Partnering for the Knowledge Economy*, Luc E. Weber and James J. Duderstadt, eds, Economica, Paris, London, Geneva (2006)
6. *The Globalization of Higher Education*, Luc E. Weber and James J. Duderstadt, eds, Economica, Paris, London, Geneva (2008)
7. *University Research for Innovation*, Luc E. Weber and James J. Duderstadt, eds, Economica, Paris, London, Geneva (2010)
8. *Global Sustainability and the Responsibilities of Universities*, Luc E. Weber and James J. Duderstadt, eds, Economica, Paris, London, Geneva (2012)
9. *Preparing Universities for an Era of Change*, Luc E. Weber and James J. Duderstadt, eds, Economica, Paris, London, Geneva (2014)
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11. *The Future of the University in a Polarizing World*, Luc E. Weber and Howard Newby, eds, The Glion Colloquium, Geneva (2018)
12. *The University at the Crossroads to a Sustainable Future*, Luc E. Weber and Bert van der Zwaan, eds, The Glion Colloquium, Geneva (2020)
13. *Universities as the fifth power? Opportunities, Risks and Strategies*, Ana Mari Cauce, Yves Flückiger and Bert van der Zwaan, eds, The Glion Colloquium. ISCA Geneva (2022)

Declarations

1. Rhodes, F. H. T. *The First Glion Declaration: The University at the Millennium*, The Glion Colloquium (1998)
2. Rhodes, F. H. T. *The Second Glion Declaration: Universities and the Innovation Spirit*, The Glion Colloquium (2009)

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Cover illustration by Prof. Ana Mari Cauce, created during the 13th Colloquium

DEDICATION

To Prof. Dr. Luc E. WEBER
Recognized diplomat & leader for Higher Education Institutions
Respected scholar, scientist and teacher
Distinguished University President

His colleagues and friends in the Glion organizing committee
and the editors dedicate this volume to him, with gratitude,
for his initiative in founding the Glion Colloquium together
with James J. Duderstadt and Werner Z. Hirsch from the U.S.
His early enthusiasm to make higher education a focus
for international discussion and reflection,
his creative ideas, wisdom, leadership and engagement from 1998 onwards,
have made possible the development and influence of the Glion Colloquium.
The Glion Colloquium owes it success to his dedication to innovative ideas
and perseverance to bring them out into the world.
By founding the Glion Colloquium, along with his many other international
engagements on behalf of the university sector with governments and
businesses, Luc Weber has contributed significantly to changing, for the better,
higher education institutions worldwide.

CONTENTS

PREFACE

The Glion Colloquium held its 13th meeting on 16-20 June 2021 in Glion-above-Montreux, Switzerland. Twenty leaders of renowned universities or university organizations participated in the meeting, of whom more than a third were women presidents. Four continents were represented. Participants contributed to the topic proposed by the Programme Committee, "Universities as the fifth power? Opportunities, Risks and Strategies". The purpose of the Glion Colloquium 2021 was to deepen and widen the examination of the previous Colloquium about "The University at the Crossroads to a sustainable future", held in 2019.

The health crisis prevented about a third of the participants from being present in Glion. However, thanks to professional audiovisual support, a dialogue as fluid as possible could be guaranteed between the participants present in Glion and those active from different parts of the world. The dynamics of the Glion Colloquiums, which are characterized primarily by in-depth discussion of the topics and contributions of each participant, were thus able to develop almost as if everyone was present. This was due not only to the interest of all participants in the Colloquium, but even more so to the admirable effort of participants based in other continents who made a point of actively participating in the discussions, even though they were taking place largely outside normal hours. The Colloquium also benefited greatly from the excellent contributions of our invited speakers, namely Mrs Doris Leuthard, former Federal Councillor, Matthias Egger, President of the Research Council of the SNSF, and Didier Queloz, Nobel Laureate in Physics 2019 from the University of Geneva.

As every two years since the first Colloquium in 1998, the organizers are committed to disseminating as widely as possible the reflections and results of the colloquium in this book. The starting point of reference for the theme in 2021, "Universities as the fifth power? Opportunities, Risks and Strategies", was the observation that the world is presently in need of scientific results to

guide planning and decision-making. The topic relating to scientific communication was chosen by the programme committee before the outbreak of the pandemic and has proved to be a burning issue. Indeed, research universities, as repositories of new knowledge and trainers of experts, are particularly well placed to help society make informed decisions, based on facts, by communicating the results of their research — not to replace politicians, but to give them advice. This colloquium was therefore largely devoted to the development of platforms for meetings and exchanges between the scientific world, political actors, international governmental or non-governmental organizations and civil society. The topic of scientific diplomacy and communication was also discussed in order to determine how the university can communicate its knowledge and expertise to politics and society in a faster and more efficient way, without provoking the negative reactions that were unfortunately observed at times during the pandemic. In this sense, the basic question that the colloquium attempted to answer was about universities as a 5th power, alongside the executive, legislative, judicial institutions and the media.

There were main four main pillars discussed with proposed solutions. First, how universities communicate science, including the two-directional communication of and about science. A) Communication from universities towards society was discussed. In this sense priority was given to research that would inform and lead to policies and action to meet the most pressing societal challenges of today, such as the health, sanitary and economic crisis of 2020 or the growing threat of climate change. This also included discussions about the most effective ways to communicate outcomes of our scientific research so they can best inform major decisions in society and the authorities who will make those decisions. Discussions also explored the impact and links between teaching and research in knowledge dissemination into society. B) Communication from the community and society towards the university. This sub-category included the importance of dialogue with the community and society, and how universities can better listen and respond to requests coming from them.

Second, participants in the 13th Glion Colloquium discussed how citizens participate in research, and how society can contribute to it. From patients organizations setting medical priorities to citizen science projects harvesting and analysing millions of data points, citizens have shown they can contribute to science making.

Third, participants looked at how universities contribute and can participate even more in the development and elaboration of efficient public policies, informed by expert knowledge. This included developing an inventory and engaging in a profound critical analysis into the many ways that universities can and should contribute to societal public policy, locally and globally, highlighting both the positive and negative/delicate aspects and

where we fall short. In times when scientific knowledge is becoming more relevant to tackling major scientific challenges such climate change or other global challenges, such as the Covid-19 health crisis, the university presidents gathered in Glion debated the importance of expert knowledge drawing upon basic and applied research, as well as the role higher education institutions must play in making that knowledge relevant to problem-solving.

Fourth, the participants examined how universities became a fifth power, especially during the pandemic, focusing on the opportunities generated by this new role, but also the risks associated with the porosity between science and politics, as well as by the distrust toward universities and experts that could emerge, especially in populist political movements, when experts appear to dictate what politicians should or should not do. The advantages and difficulties of using science for knowledge diplomacy were analysed. Participants also discussed the potential consequences this has for the university and society.

More generally, these four themes touched upon the close relationship of higher education institutions towards those who govern and fund them both directly and indirectly. The question about how universities can maintain their autonomy and independence was raised during several discussions. Maintaining independence is, in turn, critical to maintaining credibility.

Inspired by the complex and challenging situation described above, the Programme Committee of the 13th Glion Colloquium invited the participants to write a contribution focused on one or more aspects of the chosen theme, and to present and discuss it in one session of the June 2021 Colloquium. The papers published in "Universities as the fifth power? Opportunities, Risks and Strategies" provide a striking set of ideas on the rapid change and growing challenges in the university sector – and this influences the objectives and duties of Higher Education and Research. The book is brilliantly introduced by the contribution of Prof. Matthias Egger, who worked as leader of the Swiss task force during the first months of the pandemic. His perspective on the crisis and the reaction of the Swiss authorities during this period is timely and fascinating. Moreover, it is a perfect illustration of the role played by experts and universities during the pandemic.

Although most chapters of this volume cover different aspects of the general theme, we have structured the book in four main parts. Part I is devoted to the question of how universities communicate science. Part II examines how citizens participate in research. Part III demonstrates how universities can contribute to efficient evidence-based public policy-making. Finally, Part IV shows how universities have rapidly become a fifth power.

In the first article of the book, Martin Vetterli *et al.* make many useful recommendations about how experts should communicate with politicians

and civil society and more clearly explains how science works. In the second paper, Nicholas B. Dirks highlights the importance of interdisciplinary collaboration between the Arts and the Sciences, by concluding that only a combination of the two will lead to success by communicating research with societal impact. Karen Maex *et al.* discuss the importance of building public online platforms for scientific communication, to keep the scientific independence of research and the control of scientific communication guaranteed. Underlying what Nicholas B. Dirks recommends in his contribution, Ivanka Popović emphasizes the importance of communicating efficiently between academic disciplines in order to achieve a global perspective towards society and authorities.

This communication should be supported by use of a more commonly understood language across different research domains, according to Ana Mari Cauce *et al.* (Part II: how citizens participate in research). She and her colleagues propose a model of a university to serve all and explain that the integration of the whole society into the academic world can serve as an accelerator for the improvement of social well-being in general. Kerstin Krieglstein *et al.* offer an interesting insight on how to create trust in science by including society into research projects and by providing background information that is understandable and accessible to a non-scientific community. Mamokgethi Phakeng argues for a fundamental change in the role universities should play, in particular on an international level. According to her, only a shift towards a more equal and decolonized research culture will bring equal and efficient contributions towards the much-needed progress of our society. In addition, Sabine Kunst offers a perspective on how artistic projects from society can shift consciousness of the society and the scientific community. The influence artists and science can have on the development of new academic approaches is also highlighted.

In Part III, contributions show how universities contribute to efficient public policy-making. Michael Spence suggests that a university should be a space for open discussions, where different opinions and research findings are equally welcome. C. Raj Kumar suggests among others a transparent university. To influence public policy in a more efficient way, he proposes, for example, the creation of public and academic schools and research centres that should be closely related to each other. Vahan Agopyan *et al.* emphasize the equal importance of both fundamental and applied research for the advancement of efficient public policies. Only a combination of both will give a complete basis for political decision-making. For Michael Schaepman *et al.*, critical thinking, emotional intelligence, an open university including fundamental and interdisciplinary research will contribute best to a sustainable society and improve the sharing attitude from science towards society. For Meric S. Gertler, in addition to sharing scientific information with society,

an inclusion of communities where distrust in science is the largest seems to be crucial for a better scientific communication. He presents in detail how and which communities are currently "excluded" from accessing science (or university studies) and suggests facilitating access for them to be able to study in higher education institutions may then lead to larger trust in science.

Part IV discusses how universities rapidly became a fifth power, a role that has been reinforced during the pandemic. Joël Mesot proposes to bridge the gap between diplomacy and science on an international level. According to him, scientists and diplomats need to learn how to combine the two cultures which as a result will enlarge the impact of science diplomacy. Tony F. Chan *et al.* discuss the question of resilience, which can only develop in a society if the university itself is resilient. They show how universities evolve smoothly and independently from the marketplace that is so critical to corporate interests. This helps them to stay resilient and wield a soft power within society. For Bert van der Zwaan, universities have more and more impact on society through the concept of knowledge diplomacy. He gives insights on how universities can become the fifth power and influence society but also highly recommends the importance of freedom of research and the liberty of science to speak the "truth". Yves Flückiger *et al.* reinforce the importance of science communication and suggest a new model of a university. Whereas experts should learn better how to communicate their research findings towards society, universities should stay an information platform without striving to convince society what should be considered right or wrong. Transparency and the explanation of uncertainty of the research process therefore plays a crucial role in staying close to academic research realities and, at the same time, be as open as possible towards society. A democratic process of science, open discussions between science and society, the acceptance of different opinions and open-mindedness are crucial factors for a successful "university as a fifth power".

In the papers in this book and presentations made during the Colloquium, there was a clear agreement that universities have demonstrated resilience and produced exceptional results during the pandemic. They did it thanks to a massive globalized and multidisciplinary efforts (*Scientists without borders*). As is often the case, this academic contribution has not yet been fully appreciated and valued by society, including government authorities. Operating at the leading or cutting edge of worldly developments, universities have to contend with a time gap between acting and being recognized. In addition, the discussions showed that universities need to be prepared for the next catastrophe. The capacity to adapt and react quickly has now become a crucial component of higher education governance.

For universities to continue to play the role of the 5th power beyond the pandemic period, it is crucial that they be able to create society's trust in

science using more appropriate scientific and academic communication by explaining the process of academic research and by including more broadly the civil society and the public in scientific endeavours. The discussions showed the importance of communicating about science to young people and helping them understand more about scientific practices and how scientific knowledge is developed. It is important to consider the uncertainty of scientific results and teach probabilities since the results of empirical research are always associated with a confidence interval that increases with the amount of data collected. In this respect, it could be interesting to create or use existing MOOCs on how science works geared toward a younger audience.

In addition, to face the major challenges of our society, be it the current health crisis or other environmental challenges, we need to build multidisciplinary and multi-institutional platforms between different stakeholders in order to include all actors in finding solutions to future global crises. There is a need to build new bridges between the academic world and policy-makers, international organizations, the private sector and civil society.

During the discussions in the 13th Glion Colloquium, it became obvious that scientific communication is not the solution itself. Effective and multilayered approaches are needed to bridge the gap between academia and civil society, as well as policy-makers and other authorities as it relates to academic and scientific knowledge. The discussions highlighted the importance of communicating the right amount of science to keep it clear and structured. Science communication needs to inform, to be transparent and avoid adopting communication strategies based on the will to convince. Transparency and honesty are therefore a crucial aspect when communicating about scientific results.

The XIII Glion Colloquium was arranged under the auspices of the University of Geneva and was made possible thanks to generous support from the Swiss State Secretariat for Education, Research and Innovation (SEFRI), the Swiss federal Institutes of Technology of Lausanne (EPFL) and Zurich (EPFZ), and the universities of Geneva (UNIGE) and Zurich (UNIZH), to all of whom we are most grateful.

We also wish to thank those who contributed to the colloquium and to the production of this book, in particular Dr Gerlinde Kristahn, Secretary General, who was the linchpin of the Glion Colloquium Association and organization. Our deep thanks to Luc Weber (Founding President) and Marianne Weber, who supported the organization of the colloquium with their long-standing experience and passion for this project. Our thanks also go to Luciana Berrebi for her support to the Colloquium, Mathias Popee and Robinson Vasquez for their technical support and, finally, to Edmund Doogue in Perth, West Australia, who provided rigorous editorial assistance.

Without these most competent people and generous institutions, the XIII Glion Colloquium could not have taken place.

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Glauco Arbix is professor of sociology at the University of Sao Paulo, and has a PhD in Sociology at USP; He was a post-doctorate in Political Science at MIT and post-doctorate at the London School of Economics; He is also a Research Fellow at the Center of Latin American Studies/Sociology, UC-Berkeley and a Visiting Researcher at Columbia University (SIPA). Glauco Arbix's research focuses on innovation, science and technology.

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Tony F. CHAN

Professor Chan assumed his role as the third president of KAUST in September 2018. He led a strategic planning process to take KAUST into its second decade, including growing the faculty and students by up to 50%. He has expanded KAUST's research emphasis from energy, water, food and environment to include digital and health, launching new initiatives in Artificial Intelligence, Smart Health, Cyber Security and Circular Carbon. He is increasing investment and capacity in innovation, entrepreneurship and knowledge transfer. By positioning the University to leverage Saudi Arabia's ambitious Vision 2030 strategic plan, he is strengthening its engagement with the nation. Finally, he is leading efforts to enhance the global and national visibility of KAUST.

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Dr Shiyi Chen became the second president of SUSTech in 2015. Previously, Dr Chen served in the roles of Vice President for Research, Dean of the Graduate School and the founding dean of the College of Engineering at Peking University, the Department Chair of Mechanical Engineering at Johns Hopkins University, and the Deputy Director of the Center for Nonlinear Studies at Los Alamos National Laboratory. Dr Chen is an elected member of Chinese Academy of Sciences and the Third World Academy of Sciences.

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Matthias EGGER (Guest)

Matthias Egger is President of the National Research Council at the Swiss National Science Foundation (SNSF). Since 2002, he has been a professor of epidemiology and public health at the University of Bern. Until 2016, he headed the university's Institute of Social and Preventive Medicine. He has also been a Professor of Clinical Epidemiology at the University of Bristol in the U.K. since 2002. In 2017 he was elected President of the National Research Council of the SNSF. Between April and July 2020, he led the scientific task force advising the Swiss government on the COVID-19 pandemic. Prof. Egger is currently working on projects involving vaccination against Ebola, studies on HIV/AIDS, tuberculosis and cancer in southern Africa, as well as methodological projects.

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Gérard Escher obtained his diploma in Biology at the University of Geneva, and his PhD (Neuroscience, 1987) at the University of Lausanne, where he led a research group working on synapse formation, after a postdoctoral fellowship at Stanford University. For ten years he worked as Scientific Advisor and Assistant Director at the Swiss State Secretariat for Education and Research. Since 2008 he has served as a senior advisor to EPFL Presidents Patrick Aebischer and Martin Vetterli.

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Yves Flückiger holds a degree in Economics and Sociology, as well as a doctorate in Political Economy. He joined the Faculty at the University of Geneva in 1992, directing the University Employment Observatory and the Leading House center of excellence in Education Economics. Since July 2015 he has been the Rector of the University of Geneva and, since February 2020, President of swissuniversities.

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David Keyes is Senior Associate to the President for Strategic Priorities and Global Positioning at KAUST, where he was founding Dean in 2009. Dr Keyes previously led multi-disciplinary research programmes for the U.S. Department of Energy and taught at Columbia, Old Dominion, and Yale Universities. He earned a B.S.E. in Mechanical Engineering from Princeton and a PhD in Applied Mathematics from Harvard. He is a Fellow of SIAM, AMS and AAAS.

Kerstin KRIEGLSTEIN

Kerstin Krieglstein took office as Rector of the University of Freiburg in October 2020. She has made science communication a priority by establishing the Business unit Science Communications and Strategy as part of the University administration. The goal of this new unit is to support the University's future direction in terms of content and organization.

C. RAJ KUMAR

Professor C. Raj Kumar, a Rhodes Scholar, is the founding Vice Chancellor of O. P. Jindal Global University, which is India's First Ranked Private University in the QS World University Rankings 2022. He completed his higher education at five universities around the world: Loyola College, University of Madras, India; University of Delhi; University of Oxford; Harvard University; and the University of Hong Kong.

Sabine KUNST

Sabine Kunst has been the President of Humboldt-Universität zu Berlin since May 2016. From 2011 to 2016, she was Minister for Science, Research and Culture in Brandenburg. From 2007 to 2011, she was President of the University of Potsdam. Before this, she held several senior positions as university teacher and researcher, including Vice President for Teaching, Studies and Further Education at Universität Hannover. From 2010 until 2011, Sabine Kunst was the very first female President of the German Academic Exchange Service (DAAD).

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Doris LEUTHARD (Guest)

Doris Leuthard is currently working in the private sector as Vice-president of the Board of the Coop Group, Bell Food Group and a Board member of Transgourmet International and Stadler Rail. In addition, she is President of the Ulrico Hoepli Foundation, Co-President Steering Committee of the Europa Forum Luzern, President of the Swiss Digital Initiative, Member of the ETH Foundation, of the Kofi Annan Foundation and member of the ICRC Advisory Board. She studied law at the University of Zurich and is a qualified attorney at law. In 1999, she was elected to the Swiss National Council. From

2004 to 2006 she presided the Christian Democratic Peoples Party. From 2006 to 2018, she was a member of the Swiss Federal Council and elected President 2010 and 2017. For four years she was the Head of the Federal Department of Economic Affairs and for eight years Head of the Federal Department of Environment, Transport, Energy and Communication. In these functions she represented Switzerland in different institutions such as OECD, ILO, FAO, WTO, UNEP, IGF, WEF and the Paris climate negotiations. From 2018 she was also member of the UN High-Level Panel on Digital Cooperation.

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Joël Mesot studied physics at ETH Zurich, obtaining a doctorate in solid-state physics in 1992. He was awarded the ETH Zurich Latsis Prize in 2002 and the Swiss Physical Society (SPG) IBM Prize in 1995. After research residencies in France and the U.S., he came to ETH Zurich and joined the PSI, where he became Head of the Laboratory for Neutron Scattering in 2004. He was director of the PSI from 2008 to 2018, and since 2008 he has been full professor of physics at ETH Zurich. Joël Mesot is part of various national and international advisory bodies. He is a member of the Board Committee of the Swiss Innovation Park "Switzerland Innovation", the Marcel Benoist Foundation, the Global Network Advisory Board of the World Economic Forum (WEF) and the Governing Board CREATE (Singapore).

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Ali H. Mokdad is Chief Strategy Officer for Population Health at the University of Washington and a Professor of Health Metrics Sciences at the Institute for Health Metrics and Evaluation. Dr Mokdad has published groundbreaking work on local-level disease trends and some of the leading risk factors for poor health. His work on obesity is among the most highly cited in the field. Prior to joining the University of Washington, Dr Mokdad worked at the U.S. Centers for Disease Control and Prevention for 20 years, including with the International Health Program; the Division of Nutrition and Physical Activity; the National Immunization Program; and the National Center for Chronic Disease Prevention and Health Promotion, where he was Chief of the Behavioral Surveillance Branch.

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Professor Mamokgethi Phakeng is Vice-Chancellor of the University of Cape Town, South Africa. She holds a PhD in Mathematics Education from the University of the Witwatersrand. She is a highly regarded B1 National Research Foundation-rated scientist, with over 80 research papers and five edited volumes published. In 2008 she became the first black South African researcher to co-chair a study commissioned by the International Commission on Mathematical Instruction: "Mathematics and Language Diversity" (2016).

Ivanka POPOVIĆ

Prof. Dr Ivanka Popović has been the Rector of the University of Belgrade since 2018 and is currently President of the Serbian Rectors Conference and the Rectors Forum of South-East Europe and the Western Balkans. Previously, she has presided over the Danube Rectors Conference and the UNIADRION Network. Dr Popović is a professor at the UB – Faculty of Technology and Metallurgy. Her research interests are polymer science and engineering and sustainable development. She was recently elected to the Board of the European University Association.

Didier QUELOZ (Guest)

Didier Queloz holds the Jacksonian Professorship of Natural Philosophy at Cambridge, a chair professorship at ETH-Zurich, departing from part-time professorship at Geneva University. He was awarded the 2019 Nobel Prize in Physics for his joint discovery with Michel Mayor of the first exoplanet. Didier Queloz's key contribution to science has been to obtain information on the physical structure of exoplanets. To this purpose he participated and conducted programmes leading to the detection and characterisation of a hundred planets, include many breakthrough results. More recently he is directing his activity to the detection of Earth-like planets and Universal life.

Michael SCHAEPMAN

Prof. Dr sc. nat. Michael Schaepman has been President of the University of Zurich (UZH) since August 2020. Before his present position, Prof. Schaepman acted as member of the Executive Board of the University responsible for the areas of research, innovation and academic career development. Between 2014 and 2016, he was Vice Dean and Dean of the Faculty of Science at UZH. He studied geography, experimental physics and informatics at the University of Zurich (UZH) and earned his doctoral degree at the Department of Geography of UZH in 1998. Following postdoctoral work at the University of Arizona in Tucson, U.S., Dr Schaepman returned to the UZH Department of Geography in 2000 to head up a research group. In 2003, he was appointed professor of geographic information science at

the Department of Environmental Sciences at Wageningen University (Netherlands), where, as of 2005, he acted as academic head of the Center for Geoinformation. In 2009, he was appointed professor of remote sensing at the UZH Department of Geography. Michael Schaepman's research priorities include Earth observation, remote sensing, and spectroscopy to measure biodiversity from space.

Michael SPENCE

Dr Michael Spence took up his post as President & Provost of UCL in January 2021, before which he was Vice-Chancellor and Principal of the University of Sydney for 12 years. Dr Spence is recognized internationally as a leader in the field of intellectual property theory and holds a Doctor of Philosophy from the University of Oxford, where he headed Oxford's Law faculty and Social Sciences division. An alumnus of the University of Sydney, Dr Spence has a BA with first-class honours in English, Italian and Law. His other languages include Chinese and Korean. In 2017, he was awarded a Companion of the Order of Australia in the Australia Day Honours for service to leadership of the tertiary education sector, to the advancement of equitable access to educational opportunities, to developing programmes focused on multidisciplinary research and to the Anglican Church of Australia.

Subra SURESH

Subra Suresh is President and Distinguished University Professor at Nanyang Technological University, Singapore. A former Director of the U.S. National Science Foundation, he now serves as an independent Director of the Board of HP Inc. (HPQ) and Singapore Exchange (SGX). He has been elected a member of all three branches of the U.S. National Academies – Engineering, Sciences and Medicine, and a foreign member of science academies in China, France, Germany, India and Spain. He has been awarded 18 honorary doctorate degrees from institutions around the world.

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Bert van der Zwaan is emeritus professor of Biogeology at Utrecht University in the Netherlands and was Rector Magnificus (Vice Chancellor) of Utrecht University from 2010-2018. He was member of the board of directors and president of the European League of Research Universities (LERU, 2013-2018) and is author of the book *Higher Education in 2040* (2017). Since retiring, he has been chair of the Board of Trustees of NUFFIC (the national agency for internationalization) and chair of the Dutch National Research Agenda. He writes about higher education and is nationally and internationally active in supervisory and advisory boards.

Martin VETTERLI

Researcher, teacher and expert of the Swiss education and research landscape, Martin Vetterli was appointed president of the École polytechnique fédérale de Lausanne (EPFL) in 2017. He is also a world-known expert in the areas of electrical engineering, computer sciences and applied mathematics and a full professor at the audiovisual communications laboratory at EPFL. From 2013 to 2016, he was President of the National Research Council of the Swiss National Science Foundation.

Luc E. WEBER

An economist and professor of public economics at the University of Geneva, Luc Weber served for more than 30 years in Higher Education and Research in Switzerland, Europe and the wider world. Vice-Rector and Rector of his University and President of the Swiss Rectors' Conference, he then served numerous international university organizations, governmental and non-governmental, European and worldwide: President of the Steering Committee for Higher Education and Research of the Council of Europe, Vice-President of the International Association of Universities and founding Board Member of the European University Association. His excellent knowledge of the sector inspired him to create and conduct, from 1998 onwards, the Glion Colloquium.

SPECIAL ADDRESS

Covid-19 in Switzerland: Frontline report on Science and Politics

Matthias Egger

On 25 February 2020, the first person with Covid-19 in Switzerland was diagnosed. Until then, the Swiss National Science Foundation (SNSF) had funded thousands of projects and young researchers, including projects on coronaviruses. Since its foundation in 1952, the foundation has contributed to making Switzerland a leading knowledge nation. Swiss universities occupy top positions in international rankings, the number of patents per capita is high, and there is close cooperation with industry. According to the Global Innovation Index, Switzerland was once again the most innovative country in Europe in 2020 (De Boer, 2021). In this article, I will summarize and extend the presentation I gave at the 2021 Glion colloquium, addressing the response of the scientific community and the SNSF to

the Covid-19 crisis, the increasing concerns regarding the response from the Federal Office of Public Health (FOPH), and the lessons learned for science communication and the collaboration between science and politics.

RAPID RESPONSE

Not surprisingly, the scientific community's reaction to the impending Covid-19 pandemic was not long in coming. In January 2020, Althaus and Riou analysed data from China and warned of a global pandemic due to the high reproductive potential of the novel virus (Riou & Althaus, 2020). Shortly later, Thiel and colleagues succeeded in artificially copying the SARS-CoV-2 virus (see Thi Nhu Thao *et al.*, 2020). The first large seroprevalence study by Stringhini and colleagues showed that there was little immunity in the population in Geneva after the first wave (Stringhini *et al.*, 2020). In June, the SwissCovid app, co-developed by EPF Lausanne, was launched, setting new standards in terms of data protection (FOPH, 2020). At the end of 2020, Beerenwinkel's group at ETH Zurich became the first in the world to detect the alpha variant of SARS-CoV-2 in waste water (Jahn *et al.*, 2021). Researchers from Switzerland (excluding those based at the World Health Organization) had published over 1,500 scientific articles in 2020, which had been cited over 50,000 times at the time of writing.

On 6 March 2020, the SNSF responded by launching a special call for proposals for research into SARS-CoV-2. On its data portal, it set up a Covid-19 project register that provides an overview of research on Covid-19 in Switzerland funded by the SNSF, Innosuisse and Horizon 2020 (SNSF Data Portal, 2020). On behalf of the Federal Council, it launched the biomedically oriented National Research Programme (NRP) "Covid-19" in April 2020 (NRP 78 — Covid-19, 2020) and, a year later, NRP 80, which will focus on the social and political aspects of the crisis (NRP 80 — Covid-19 in Society, 2021).

INCREASING CONCERNS AMONG SCIENTISTS

In February 2020, Swiss scientists became increasingly concerned about the attitude and communication of the FOPH. As part of the Federal Department of Home Affairs, the FOPH is responsible for public health, including infection prevention and control (FOPH, 2021). The reasons for these concerns were various scientifically unsupported or incorrect statements. The statement that Covid-19 mortality is roughly comparable to that of seasonal influenza by the head of the Division of Infectious Diseases of the FOPH prompted researchers from the Universities of Basel and Bern and EPFL to

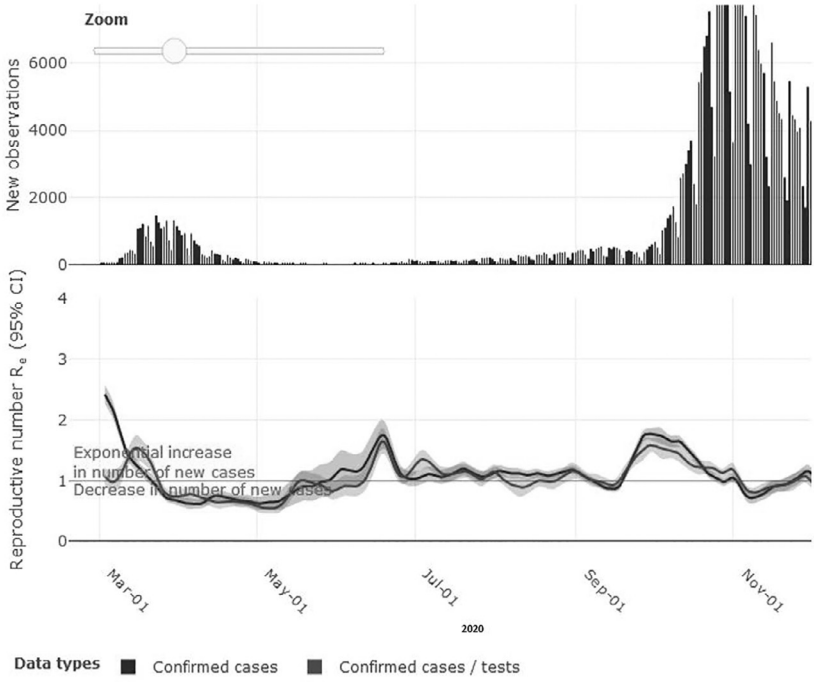
react. In a letter to the Minister of Health and the FOPH, they pointed out on 25 February that, based on the available data, the mortality of Covid-19 is at least a factor of 10 higher and that a high number of serious illnesses and deaths should be expected in Switzerland (Althaus *et al.*, 2020). At the same time, the call for a scientific task force to advise authorities and politicians grew louder. On 18 March 2020, a scientific delegation met with the health minister and representatives of the FOPH to discuss the possible contribution of science. Two days before, the "extraordinary situation" according to the Swiss Epidemics Act came into force: shops, restaurants and bars, as well as entertainment and leisure facilities, were closed.

THE BIRTH OF THE SCIENCE TASK FORCE

At the beginning of April 2020, the interdisciplinary Swiss National Covid-19 Science Task Force was set up (Swiss National Covid-19 Science Task Force, 2020). According to the mandate from the government, around 70 volunteer experts, many of whom dropped all their other commitments, should advise the FOPH and politicians at the federal and cantonal levels. The task force organized itself into ten working groups covering biomedical and public health, but also ethical, legal and economic aspects of this health crisis. The modelling group swiftly began to estimate the effective reproductive number (Re) on a daily basis. Re indicates how many people one infected person infects on average at a given point in time. If Re is above 1, the infection spreads exponentially; below 1, it dies out.

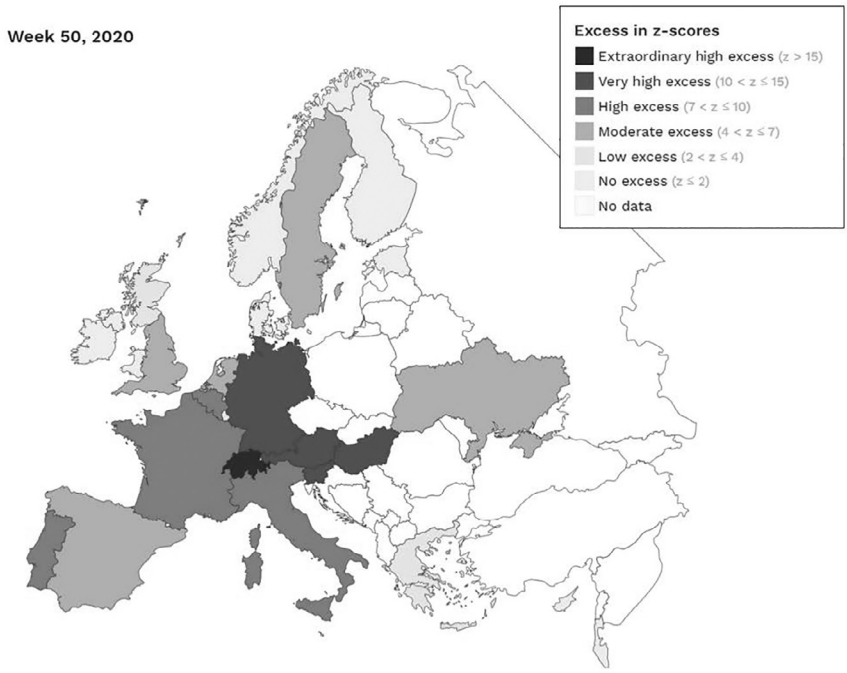
On 11 April 2020, the task force published an important paper on the criteria for relaxing or tightening the measures (Proposal Transition Strategy — Swiss National Covid-19 Science Task Force, 2020). It recommended that measures be eased only when Re is substantially below 1, and other indicators are also below critical levels. Conversely, measures should be tightened if Re is above 1 and other indicators are above critical levels. Unfortunately, this recommendation received little attention. Case numbers dropped until the beginning of June 2020, but rose again thereafter (Figure 1). In June 2020, most control measures were lifted. By mid-September 2020, Re was robustly above 1, and the number of cases rose steeply. Nevertheless, additional measures were not introduced until 19 October 2020.

Figure 1 – Screenshot of the Swiss National Science Task Force dashboard showing the number of new Covid-19 cases (upper panel) and reproductive number estimated based on the confirmed cases or confirmed cases per test. From (Swiss National Covid-19 Science Task Force, 2020)



Consequently, the second wave was much more pronounced than the first: most of the Covid-19 deaths in Switzerland can be attributed to it (Riou *et al.*, 2021). By the end of 2020, excess mortality in Switzerland was at the top of 29 European countries (Figure 2). Of note, socioeconomic differentials became evident, with people living in neighbourhoods of higher socioeconomic position more likely to be tested but less likely to test positive, be hospitalized, or die than those living in less affluent areas (Riou *et al.*, 2021).

Figure 2 – Excess mortality in Switzerland end of the year 2020.
From (EUROMOMO, 2021).



Up to September 2021, the task force published over 90 policy briefs on their website, addressing a wide array of topics, including the prevention of SARS-CoV-2 in Switzerland in summer 2021, in the context of variants of concern and vaccination or the protection duration after vaccination or infection (Swiss National Covid-19 Science Task Force, 2020). Unsurprisingly, the most recent brief discusses the necessary preparations in academic institutions to prevent SARS-CoV-2 infections during the next semester.

LEARNING THE LESSONS

We are always wiser in hindsight, and it is easy to criticize others when one is not in the hot seat of the decision-maker. All those who have had to make the important decisions in this crisis deserve respect. Nevertheless, the bon mot of former British Prime Minister Harold MacMillan is important: "The past should be a springboard, not a sofa". Or, to quote Albert Einstein, "The only mistake in life is the lesson not learned." It is essential that in Switzerland and elsewhere, we learn the lessons of the Covid-19 pandemic. We need to think

carefully about what the government agencies and the scientific community can do to manage future crises better.

Switzerland's political system ensures legitimacy and long-term compromises (Buerkli, 2020). Federalism allows for pronounced regional diversity and autonomy. The Swiss system strives for perfection and takes its time to achieve it. It might often rather do nothing than possibly make a mistake by acting swiftly. This system has strengths, but it is far from ideal for dealing with a pandemic. Dr Mike Ryan of the World Health Organization (WHO) put it in a nutshell: "You need to stop the chain of transmission. Be fast. Have no regrets. The greatest error is to be paralysed by the fear of failure. The virus will always get you if you don't move quickly. Speed trumps perfection." (Michael Ryan, WHO Health Emergencies Programme at Daily Press Briefing on Covid-19, 13 March 2020).

The pandemic brought to light the weaknesses of the Swiss political system of federalism. At times a patchwork of measures emerged, leading to shopping and gastronomic tourism from one canton into nearby cantons with less stringent measures. In the case of contact tracing, essential for combating the pandemic, there was no legal basis for a centralized system. The result was a "cantonal app chaos" (CH++, 2020). Other problem areas were the sometimes inadequate and contradictory communication by federal and cantonal authorities and inconsistent vaccination programmes and testing strategies. A national database on contact tracing and vaccinations is still lacking today.

Switzerland's response should be analysed promptly, involving policy-makers, civil society and academia, and develop evidence-based proposals for reform and legislative change. The Epidemics Act and its interpretation should be reconsidered. Switzerland must be better prepared for pandemics and other crises in the future, with short and clear political decision-making paths. The SNSF's research programmes on Covid-19 can make an important contribution here.

SCIENCE COMMUNICATION

There are also lessons to be learned for science and evidence communication. The task force, and its communication, was criticized and sometimes rightly so: it was perceived as too multi-voiced and inconsistent. It was often difficult for society and politics to distinguish between the carefully developed assessments of the task force and the ad hoc opinions of its more vocal members.

What works in normal times may not be appropriate in a crisis (Egger, 2021). In this context, it is interesting to compare the "Top Five Tips for Communicating Science" presented in *New Scientist* in 2009 (Olson, 2009) with the "Five Rules for Evidence Communication" published in *Nature* in November 2020 (Blastland *et al.*, 2020). The first top tips come from marine biologist turned film-maker Randy Olson and his book titled *Don't Be Such a Scientist*: (i) improvization, (ii)

marketing, (iii) dramatization, (iv) visualization and (v) telling a good story. They coincide with my personal experiences in media training. We should come across as a natural, spontaneous person, we were told. Not as boring scientists. We should not worry if what we say is not 100% scientifically correct. Our research has produced interesting results. It is not enough just to summarize these results. According to Olson, we now must bring them to the people, packaged in a good story, with simple language and catchy graphics.

David Spiegelhalter, Professor of the Public Understanding of Risk at the University of Cambridge (U.K.) and his interdisciplinary team developed five tips that differ significantly from Olson: (i) inform, don't persuade; (ii) offer balance, not false balance; (iii) disclose uncertainty; (iv) discuss the quality of the evidence; (v) fight misinformation (Blastland *et al.*, 2020). As these authors point out, Olson's tips reflect effective and practical communication techniques. Still, they carry dangers: during the Covid-19 pandemic in Switzerland and elsewhere, we repeatedly witnessed the failure of such a marketing approach to science communication.

Expertise, honesty and good intentions build the trust that is essential in a crisis. When scientists give the impression that they are on a mission, trust is quickly lost. The same happens when scientists ignore issues that are important to many people. As scientists, we need to tell the whole story, including what we don't know. Many of us, myself included, underestimated this virus and wished we had done a better job of highlighting uncertainties, such as the uncertainties regarding the emergence of variants or the transmission through aerosols. Finally, we need to anticipate how our statements could be misunderstood or misused by other actors.

BUILDING BRIDGES IN A STORM: POLITICS AND SCIENCE

The Science Task Force, the ETH institutions, the Swiss universities, the SNSF and other Swiss science stakeholders have contributed significantly to addressing this crisis. An ongoing scientific analysis of the epidemic is central: a more cautious approach in spring and summer 2020 and a rapid response in autumn could have defused the second wave. Unfortunately, the task force and its recommendations were not welcome during this time. It took months to establish constructive cooperation with the FOPH and regular exchanges with politicians.

This is not surprising: Switzerland has few mechanisms for exchange between politics, science and society. The centralization of scientific advice is a challenge in federal Switzerland. Science and politics are largely independent of each other: both the "scientification" of politics and the politicization of science are low (Hirschi & Sager, 2021). In contrast to other countries such as the U.K., the engagement of science in policy-making has little tradition in Switzerland.

Defined as "knowledge exchange between scientists and policy-makers through regular dialogue and cooperation", such an exchange now needs to be established, adapting international best practices to the Swiss context (Cantalou, 2021). For example, the "Knowledge Management for Policy" (KMP) initiative of the European Commission's Joint Research Centre (JRC) emphasises eight key practices (Table 1). The exchange should be strengthened at both the administrative and the political levels. There should be a regular exchange between authorities and science, and cooperation should be actively promoted. It would make sense for actors in the education, research and innovation sectors to join forces and regularly exchange ideas with actors at the political level. Contacts should be maintained with the executive and the legislature, the cantons and the top officials of the federal offices. In this way, trusting cooperation can develop and, in times of crisis, well-rehearsed mechanisms can be resorted to.

Table 1: Eight skills for Knowledge Management for Policy

Activity	Skill
Synthesising research	Employ state-of-the-art methods to make sense of the evidence available on a given topic, based on research questions "co-produced" with policymakers and civic society.
Managing expert communities	Foster communities of experts that share a common language and understanding, across disciplinary and policy divides.
Understanding policy and science	Facilitate a better understanding of the policy process and of the norms and language of science.
Interpersonal skills	Facilitate skills and environments that allow actors to interact well in teams to help solve problems.
Engaging with citizens and stakeholders	Engagement with stakeholders and citizens to combine scientific expertise with other types of knowledge to increase relevance and impact.
Communicating scientific knowledge	Effective communication skills are essential, but the marketing approach to science communication has its dangers in a crisis.
Monitoring and evaluation	Monitoring and evaluating of impact helps improve the influence of evidence on policy-making.
Knowledge brokerage	We need professional "knowledge brokers" and science advisors with the skills to explain the evidence and its implications regarding options and the likely impact of choices.

Adapted from Topp *et al.*, 2018.

IMPLICATIONS FOR RESEARCH FUNDING

The mobilization of the Swiss scientific community to address the Covid-19 pandemic was (and continues to be) necessary. It is welcomed by the population and overall has strengthened confidence in science (Covid-19 Edition of the Science Barometer Switzerland, 2020). But there should be no one-sided and short-sighted orientation of research towards fighting the pandemic ("Covidisation") (Egger, 2020). Research should not only focus on dealing with the acute crisis, but also analyse the causes. Furthermore, funders should examine the impact of the pandemic on scientists and their research. For example, the SNSF is analysing its longitudinal study in career funding (Swiss National Science Foundation, 2021). Initial results show that female researchers did more care work than their male colleagues and consequently suffered professional disadvantages. In the social sciences and humanities, there was a decrease in the proportion of women applying to the project funding call in April 2020.

CONCLUSIONS

In conclusion, the SNSF will continue to give preference to bottom-up funding, based on the conviction that scientists are best placed to identify promising research topics. Only thanks to years of internationally networked basic research, the rapid development of PCR tests and new mRNA vaccines was possible. At the same time, the SNSF wants to do more to ensure that the research it funds uses synergies and responds more quickly to societal needs. We need a vision and strategy for science and innovation that is supported by the people, and urgently need to intensify the exchanges between science, politics and society.

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PART I

How Universities Communicate Science

CHAPTER 1

Communicating Science in Times of Pandemic

Gérard Escher & Martin Vetterli

Science and science communicators have been front and centre during the Covid-19 crisis. They will thus have to durably adapt to a situation where science is both immediate and emergency or solution-driven. This both an opportunity and a challenge.

Here we review the impact of the Covid-19 pandemic on the perception of science and expertise, especially on science communication.

WE WERE UNPREPARED, BUT SCIENCE DELIVERED

The world entered the pandemic unprepared. After the Ebola and SARS scares, it seemed obvious that in this century infectious diseases would profoundly affect the ability of nations to function and preserve social order. We were unprepared because we treat health as a commodity rather than as a human right, and therefore do not engage in prevention, and because of the prevailing illusion that national borders matter, despite the fact that we live in a globalized medical environment (Snowden, 2019) — and that viruses know no borders.

We were unprepared, but science delivered. In February 2020 the message to the EPFL community (by immunologist Prof. Jacques Fellay) was "the world now has no choice but to count on science to save lives, to predict the impact of various confinement or testing strategies, and to develop efficient antivirals and ultimately a vaccine. Whether this will be enough for society

to listen more carefully to scientists in the future is less clear… One can only hope!" And the hope seems to have come true — we do have the vaccines.

Science, in particular bio-medicine, showed a remarkable capacity to respond to the pandemic. According to the Dimensions database, close to 4% of the world's total research output in 2020 was devoted to the coronavirus. As of May 2021, researchers had published 143,130 papers dealing with some aspect of the Covid-19 pandemic, with a continuing flow of 2,000 papers per week after that. In one year, as many papers on Covid-19 were published as in two centuries on the flu! The preprint on the sequence of the original SARS-Cov-2 (Wu *et al.*, 2020) was downloaded 205,000 times in January 2020, and published in *Nature* a mere two weeks after its deposit on the BioRXiv server. Scientific papers have seen a popularity unlike ever before with Altimetric scores (a measure of public impact) reaching 35,000 — while previous records were around 14,000. One consequence : the biomedical field (finally) moved to publishing by pre-print, as more than 30,000 Covid-19 papers were first uploaded as preprints, i. e. submitted to public scrutiny before peer review.

2020 was an "extraordinary year for science" (Callaway *et al.*, 2021). Less than a month after a mysterious respiratory illness was reported in Wuhan, the country's researchers had identified the new coronavirus, soon to be named SARS-CoV-2. By 11 January, a Chinese–Australian team posted the virus's genetic sequence online (Wu *et al.*, 2020). By February, researchers worked out the mode of action of the virus (it latches on to the ACE2 receptor). Epidemiologists developed rapidly models (e. g. the Imperial model of mid-March 2020) predicting millions of deaths if no action was taken. In March-April 2020, the R0 of SARS-CoV 2 was constantly revised (upwards). EPFL's Swiss Science Data Center, in collaboration with the University of Geneva, posted a 7-day prediction model to Twitter (@Flahault) where it proved extremely popular. Thirst for science was unebbing. Quickly, scientists learned to publicly update evidence — on masks, on testing, on prediction — and to take shaky data out to the public discussion.

Scientists also responded by repurposing their research activity. On our campus, we developed Digipredict, an AI-based system that can predict whether Covid-19 patients will develop severe cardiovascular complications; Xtensio, skin sensing patches detecting when a viral illness is about to get worse; containment simulations eventually used in Italy; Gamelab, digital narratives on isolation; and a portable microfluidic technical device identifying coronavirus in airports; we also deployed virus detection in waste water. And EPFL was instrumental in creating SwissCovid, the Swiss contact tracing app, made public on 26 June after parliament approved it; SwissCovid has become a reference for privacy-respecting tracing apps. The DP3T protocol (Barraud, 2020) developed by an EPFL team has become the standard decentralized protocol, installed in many apps in millions of smartphones

worldwide. Universities showed indeed that responsible research is also research that responds to an emergency!

SCIENCE: LESSONS FROM THE PANDEMIC

In this crisis, much of the science that the public needed to know about is science-in-the-making, provisional and controversial. It is very unlike the tried-and-tested science that is found in textbooks. Science-in-the-making put strains on everyone involved (see Gregory & Miller, 1998): "on scientists, in knowing what to claim; on journalists, in assessing what is reliable and significant; and on the public, in deciding what to do". In this situation, working out the "right response" cannot be achieved exclusively from within the realm of science and requires public deliberation.

In this crisis the public got acquainted with the fact that a scientist engages in two rather different conversations (see Grinnell, 2009): one, in the lab, with the world to be studied, and the other, public, with her colleagues. The first conversation gives rise to the circle of discovery, the second gives rise to the circle of credibility — trying to convince others that the new findings are correct. Interactions within the research community depend largely on what Karl Popper named, "the friendly-hostile cooperation of scientists", or, as the coat of arms of the Royal Society says, *nullius in verba,* — "don't take anybody's word for it".

Trust in government, religious organizations, business leaders, news media is declining, as Pew Foundation surveys show repeatedly for the U.S. But science remains among the few trusted institutions. While politicians and economists dwell at bottom of the trust basket, nurses are on top, together with scientists (and historians). The Covid-19 crisis has shown that government can get greater legitimacy if it dares rely on science. In the rare cases where scientists had to go to the media to make their points against government-backed expert decisions, the public interpreted this as a classical political controversy and the trust in scientists shrunk. The most notable example is the "affaire Raoult" in France.

The pandemic took the digital revolution in which we had started to live by surprise, and digital tools, whether tracing apps, agent-based modelling or network-theory based vaccination strategies were *de facto* underused. According to Nicholas Christakis (townhall communication at EPFL), digital tools taking into account human mobility certainly brought better modelling of the spread of the virus; but the vaccine immunization campaigns for instance did not at all rely on what we know from big data and network science about spreading, and instead targeted — as in the past — the people at risk. The contact tracing apps have proven useful but were not really used to their full strength. By the end of 2020, there were at least 65 Bluetooth

(BLE)–enabled digital contact-tracing systems worldwide (O'Connell & O'Keeffe, 2021). Evidence is emerging that they have been beneficial in identifying higher numbers of contacts per case than has traditional contact tracing, shortening the time to quarantine by 1 to 2 days. The best penetration of these apps was in in Finland (45.3%), U.K. (28.5%), the lowest in New York (5.7%), Austria (6.8%), with Norway at the bottom at 2.9% . Switzerland, with the EPFL-founded SwissCovid app reached an honorable 18.7% of penetration (O'Connell & O'Keeffe, 2021).

But the biggest impact of the digital revolution was in fact its juncture with bio-medicine. This juncture allowed the rapid deployment of the new, and transformative mRNA vaccines. These vaccines are basically digital vaccines, since by typing a sequence of RNA bases into a computer, one creates a specific code for a new protein sequence that our bodies will express faithfully.

The pandemic has shown that science is diverse (and should lose its capital S). In particular, science and medicine differ. Modern medicine is still young, one might claim it was born only around 1846, at the Vienna General Hospital, when Ignaz Semmelweis introduced handwashing for surgeons. Laboratory researchers have delivered on their promises to identify the virus and then develop a vaccine against it; the vaccine's success can be measured: science is at ease here. On the other hand, when the encounter is between the virus and one sick human, the scene changes: doctors need to treat the patient in front of them, and the body can respond in surprisingly diverse modes (see Stengers, 2021); medicine is an art. Physicians were torn between waiting for results from large clinical trials and offering something to the patients in front of them. *De facto*, unproven drugs became first-line treatments at the beginning of the pandemic. But in the end, only well-conceived trials have saved lives. Only the power of big sized trials (for instance the RECOVERY trial recruiting all of Britain's hospitals) demonstrated the benefits of some treatments, and the uselessness of others. In the long term, medical art needs to be based on the best science.

Finally, the pandemic has changed how science is assessed. Assessing scientific quality took place in the public eye. In order to have more people participate in validating research results, and in order to speed up their publications, scientists have resorted intensely both to preprint servers and to Twitter. According to Prof. Caspar Hirschi (Horizons, 2020), one lesson learned from the pandemic about science evaluation is that scientific findings first have to survive *public* criticism (by other experts) before being presented to politicians as *scientific facts*. If we refrain from engaging in public debate, then we are simply fueling the technocratic illusion that there is a single scientific truth, and the only thing our politicians have to do is to implement it.

WHAT IS EXPERTISE AND WHAT HAVE WE LEARNED

The Covid-19 pandemic also gave us a chance to test one of our roles as scientists: expertise. But just who were the experts during this pandemic? There is a pragmatic answer: experts were those whom we treated as experts (Caspar Hirschi in Horizons, 2020). The impact of scientific expertise is thus dependent on personality and scientific specialization. In the Swiss case, it seems that journalists quickly became convinced that the most important experts were the epidemiologists and the virologists, while our politicians relied more on experts in clinical medicine**.** Thus Didier Pittet, a noted clinical epidemiologist, writes in his journal on 26 February (Pittet, 2020; trans. DeepL)**:** "He [a colleague] ... is one of the birds of ill omen. He predicts 30,000 victims, using bad assumptions, and claims that the government is too passive. He advocates a massive testing policy when we do not have the capacity to do so. *He confuses theoretical epidemiology with field epidemiology***,** which must take into account the means and resources available to us."

If experts are those we choose to be experts, then listening to various — and the quieter — expert voices is an imperative. "Diversity brings epistemic strength," says Naomi Oreskes (2021). In Switzerland, some epidemiologists towered above others in the debate. The top-cited epidemiologist has 1,400 press entries, according to the Swiss Media Database (Horizons, 2020). Interestingly, the first woman expert has just 50 entries! According to A. Bröhm (Horizons, 2020), women experts resisted the temptation to comment on everything much better.

The claim that scientists have expertise does not imply that this expertise is exclusive; neither does it imply "that we are all scientific experts now" (Collins, 2014). Scientists have expertise *in particular domains*, but nurses, and patients, may have considerable understanding of the progression of their disease.

"Epidemics are social as well as biological phenomena," (Shah, 2020). "Hard" science gave us vaccines, but SHAPE (social sciences, humanities and the Arts for People and the Economy) disciplines help us get to social realities, such as vaccine hesitancy. Our insight is more robust when STEM and SHAPE come together. Most scientific advisory boards and task forces were understaffed in social sciences.

Be careful with worst case scenarios — another lesson learned. For scientists, the *worst case* is just one particular value within calculated confidence levels. Not so for the press nor the public. At the beginning of the pandemic, Jürgen Habermas declared (Truong, 2020, trans. DeepDL) that "in this crisis, we must act in the explicit knowledge of our non-knowledge. To act by making explicit what one does not know is not easy either for the scientist or for the layman. The former must recognize that where his discipline does

not have certainties, the precautionary principle *does not require to automatically privilege the worst case hypothesis*." In the early months of the pandemic, worst-case scenarios were regularly announced — as such — by experts and they generated panic-provoking headlines, especially in online journalism with its snappy headlines. In short: the state of scientific knowledge should be communicated with greater candour.

"Experts, stay in lane" is one other hard-learned lesson. Many experts did not resist the temptation to comment everything, from the danger of keeping schools open to global strategies like "young people should infect themselves intentionally while older people stay at home"; "Ultracrepidarianism" became a word. Some scientists inadvertently became armchair logisticians, venturing far into test and mask logistics (Thorp, 2021b), and, as we noted above, this affected more seriously male experts.

POLICY ADVICE (SCIENCE IN THE CITY) AND WHAT WE LEARNED

Lord Robert May wrote (as cited in the *Honest Broker* [Pielke, 2007]): "The role of the scientist is not to determine which risks are worth taking, or deciding what choices we should take, but the scientist must be involved in indicating what the possible choices, constraints and possibilities are ... The role of the scientist is not to decide between the possibilities but to determine what the possibilities are". The scientist as an "*honest broker of policy alternatives*" (Pielke, 2007) "strives to expand — or at least clarify — the scope of choice for decision-making in a way that allows for the political decision-maker to reduce choice based on his or her own preferences and values." Honest brokering of policy alternatives is often best achieved through a collection of experts (as in Covid-19 task forces and advisory boards). During the pandemic, politicians, and the press, rather expected experts to make choices, to be "issue advocates", to be the force to convince the public to act correctly. And this was hard to resist.

A "clean" policy uniquely based on expert advice is not even a good idea ; we vilify *politization of policy making*, but in fact we want conflicts to be resolved through the political process, which is much better than any of the alternatives (Pielke, 2007). If we attempt to turn all policy-making into technical exercises without political debate, we fall into technocracy; technical expertise should only be an *input* to policy-making. On the other hand, the view (briefly espoused by a Swiss parliamentary committee in February 2021) that only federal authorities assume the exclusive right to present the measures decided upon, while the experts of the scientific task force would have to remain silent, was also a perversion of the role of experts. If scientific expertise is to act as an honest broker, then its claims must be presented to

the public without distortion. Silencing scientific experts by only allowing the government to present and discuss the measures decided, is wrong. "Scientific knowledge is an essential dimension of culture and progress, it is the most efficient way to understand the world around us, and this knowledge does not belong to the researchers who discover it, it belongs to the society as a whole" (Courvoisier & Mauron, 2021, trans. DeepDL). The communication of this knowledge (often controversial) is the responsibility of those who understand it best. "Democracy cannot dominate every domain — that would destroy expertise — and expertise cannot dominate every domain—that would destroy democracy" (Collins *et al.*, 2020).

Another lesson from the Covid pandemic: "Science should be at the centre of all policy making" (Morgan, 2021). Policy advice from scientists should not just be brought in when a crisis emerges. Scientists can bring data, insights and transformational discoveries, but they can also bring alternative viewpoints and ways of thinking to tackle the big issues of our time. In short, these challenges need "collective, multidisciplinary, creative, thinking, that incorporates not only economics, politics, policy and business insights, but also science" (Morgan, 2021).

SCIENCE COMMUNICATION AND WHAT HAVE WE LEARNED

Covid-19 will be remembered for many things, including that it changed science communication; much of the effect was positive (Morgan, 2021): outstanding epidemiologists, virologists and public health experts became household names. In the rapidly evolving situation, hearing directly from the scientific community was more important than ever. Scientists had the opportunity (or the pressure) to share research in real time: results, contradictions and evolving views were debated and reported on a daily basis.

What have we learned? (see also Thorp, 2021a). First, experts could have offered more hope, along with the (evidence-based) warnings, in particular in managing the "worst case scenarios" that came out of the models; the public can understand the nuances of the situation better than experts initially gave them credit for. Second, stick to your domain of expertise (see section above). Third, join the debate on the *right* social media. Scientists (and journalists) use Twitter as the preferred platform. But not the general public, especially not young people who use Instagram, Snapchat, TikTok or WhatsApp. During a pandemic, views from experts in social media are more impactful than those of celebrities or officials (Ahmad *et al.*, 2021). Finally, science communication is serious business. "It should be no more acceptable to release an untested communication than an untested drug" (Dean, 2017, citing B. Fischhoff).

Lesson learned: there is the opportunity, now that we have tested the public's thirst for science, to build a long-term partnership, build on quality science communication. Events of the past year have shown how crucial science is for the future of our society, and that researchers must engage in dialogue with the general public more frequently to explain scientific and technological issues.

What is a Science Literate Citizen? She should have a broad understanding of the *process and practice* of science, not just of scientific textbook "facts". As Johannes Kepler put it, "the ways in which we come to understand heavenly things seem to me as admirable as the things themselves". She should know (Howell & Brossard, 2021), for instance, that one single study cannot conclusively uncover the mechanisms behind a phenomenon. That uncertainty in science differs from uncertainty in politics. She should know about peer review and what makes a scientific journal trustworthy. And, importantly, understand how scientists provide checks on their own and each other's research by friendly-hostile competition and debate.

Science has to be communicated to the public, and universities have the mandate to do so! And this requires two partners: research institutions issuing positive of their activities and discoveries, and science journalists, asking critical questions about these discoveries. Indeed, universities are well inspired to develop positive public roles for their professors, not just as peddlers of their own discoveries, but as mediators of their field. While universities have generally developed their communication skills and staff in the past years, newspapers and the press in general have often diminished their scientific staff. In this duet, the press has to do its job and scientifically-versed journalists are needed more than ever.

Science will remain for a long time a key element in shaping public opinion. The sheer volume of science production today requires a knowledgeable press that can filter out the relevant and impactful discoveries. Maybe digital tools based on AI will help.

Not all knowledge is morally worthwhile. Not all science communication is morally good. Examples such as He Jiankui's public announcement of the "CRISP-R babies" or the head of the Civil Protection Department telling the L'Aquila residents fearing for an imminent earthquake, that "it's a favourable situation" make the moral challenges of communicating science explicit.

In the end, only scientists can know science through doing science. Everyone else must learn about science through other means: interactions with scientists, reading scientific papers, following twitter feeds. The challenge for science communication is to turn discoveries into stories. This begs scientists and our institutions to pair with people who excel in narratives — i.e. with the press, in particular with the popular press. Hence the decision of EPFL to work with *Blick* — the most popular newspaper in Switzerland — to

share scientific discoveries with the broader community and jointly develop leading-edge technology to achieve that goal. This partnership is an ongoing research experiment powered by state-of-the-art digital tools.

OUTLOOK

Science appears as uncertain in crises like the Covid-19 pandemic. Scientists have learned to deal with uncertainty, and to assess it. In fact, uncertainty is part of the innermost essence of research; as Richard Feynman put it, "science is not about what is true and what is not true, but about what is known with varying degrees of certainty". The cacophony of science as we are experiencing during the pandemic is therefore a normal and healthy process. The Covid-19 pandemic showed the wider public that science is a self-correcting process. There are no fixed facts, but noisy, messy deliberations that advance science and lead to decisions that benefit us all. Science and science communicators will have to learn to transmit this *essential* uncertainty to a larger public from now on. The crisis showed scientists that this openness of science (in data, publications and deliberations) is a human right — the human right to benefit from the progress of science, as promoted by the universal declaration of human rights (United Nations, 1948, art. 27,1).

The understanding of science is understanding how science builds evidence and facts, and what impacts they have on people, society and the planet. Science communication, when successful, should empower the public to attain a confidence to talk about it and a willingness to engage with science.

Science can be trusted not because it is always true, right, accurate. But it is trustworthy because of the sustained human labour that goes into making it, the integrity of the process, and because it has already transformed human life in so many ways that are obvious, transparent, profound (Oreskes, 2021).

Science cannot just be brought in when a crisis emerges; we need a continuous conversation between scientists and leaders in government, business and industry. We must create more opportunities for scientists to be incorporated into leadership and decision-making, for decision-makers to easily access scientists.

The science communication activity carried out by universities is increasingly important given the current media landscape, with divestment in science journalism. It covers a wide spectrum from promotional purposes to science communication as an intellectual pursuit. It is an essential intermediary between science institutions and wider society, but this professional science communication does not absolve scientists from their social duties to communicate publicly. We therefore have to prepare our students and researchers accordingly.

Adjust our institutional machinery to favour communication, improve the communications skills of our researchers, insert communicating into our students' education. The more that creative and well-informed people contribute, the better prepared the world will be to manage the next crisis.

Covid-19 has given the science community an amazing opportunity to shine. We need to make sure that we keep communicating what we do, and why we do it, and demonstrate how much difference we can make on a variety of problems. Let's tackle climate change next!

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CHAPTER 2

The Arts and Sciences: the Two Cultures and the Public Face of Science

Nicholas B. Dirks

The Arts and Sciences are connected in most universities, but in reality they are usually seen as representing two parallel universes, or as two cultures in C.P. Snow's canonic formulation. When Snow delivered the Rede Lectures in 1959 (Snow, 1998), he gave voice to a common assumption of university life, that the humanities and the sciences occupy not just different parts of the quads, but two distinct cultures of inquiry and understanding. Snow himself spoke as a trained scientist who had become a successful novelist, but his real target was the "literary intellectuals" who, he claimed, believed that scientists had lost the capacity to understand the deep nuances of the human condition. Snow asserted that science would reveal not just the mysteries of the universe but the path forward for humankind. He was concerned about the extent to which scientists misunderstood humanistic fields, but he was far more agitated by the dismissals of science by the non-scientists. He was convinced that science would be necessary not just to deal with the challenges Britain faced in the postwar world but with the even larger challenges of underdevelopment and poverty across the world.

Snow complained that the problem of incomprehension between the two cultures had become steadily worse during the 20th century. He advocated for changing the educational system accordingly. As he put it, "Closing the gap between our cultures is a necessity in the most abstract intellectual sense, as well as in the most practical. When these two senses have grown apart,

then no society is going to be able to think with wisdom. For the sake of the intellectual life, for the sake of this country's special danger, for the sake of the western society living precariously rich among the poor, for the sake of the poor who needn't be poor if there is intelligence in the world, it is obligatory for us and the Americans and the whole West to look at our education with fresh eyes (Snow, 1998, p. 50)." Snow's lecture was short on details and intentionally polemical, but he did suggest, as Stefan Collini puts it in an introduction to the lectures, that "we need to encourage the growth of the intellectual equivalent of bilingualism, a capacity not only to exercise the language of our respective specialisms, but also to attend to, learn from, and eventually contribute to, wider cultural conversations" (Snow, 1998, p. lvii). As Snow made clear, this was not something that could be done by asking scientists to read a few more novels or stipulating that humanists learn a few complex theorems. On the one hand, he was in favour of the American idea that education delay specialization until the second half of an undergraduate's education. On the other, however, he believed it was important that the very ethos of academic specialization accommodate a larger cultural outlook, the sense, as Collini noted, "that attending to these larger questions is not some kind of off-duty volunteer work, but … an integral and properly rewarded part of professional achievement in the given field" (Snow, p. lviii). Snow was naming the two cultures of the arts and sciences with the explicit goal of finding ways to merge them back together.

The arts and sciences had in fact been part of a single intellectual culture until the early 20th century. As Henry Cowles has demonstrated in his recent book on the scientific method, scientists of the 19th century saw themselves as exploring the same forms of knowledge as humanists. Science, like other modes of inquiry, had been based for centuries on the aligned principles of direct observation and deduction from first principles. Darwin exemplified this capacious sense of knowledge in his reliance on imagination in discovering the principles of the natural world, though he came to believe increasingly in the importance of testing scientific ideas, at least when possible. Evolution, and natural selection, were not always accessible to laboratory testing, however, and the idea of testing general principles was not initially seen as predicated on a distinctly scientific method (distinct, that is, from literary or philosophical methods). For Darwin, even the dramatic contest between science and religion was hardly prefigured in his own (at least initial) belief that evolutionary selection was a natural principle that had been established by God to work out his grand plan of creation. Cowles argues that the idea of the scientific method emerged, at least in the U.S., out of the kinds of codifications around experimentalism that were exemplified in John Dewey's work, in which Dewey specified that the methods of science were predicated on habits of thought. In his book, *How we think*, he put this

in schematic terms, specifying "five logically distinct steps: (i) a felt difficulty; (ii) its location and definition; (iii) suggestion of possible solution; (iv) development by reasoning of the bearings of the suggestion; (v) further observation and experiment leading to its acceptance or rejection; that is, the conclusion of belief or disbelief (quoted in Cowles, 2020, p. 261)."

Cowles traces a trajectory that was propelled by textbook publishers on the one side — anxious as they were to codify and simplify new ways of teaching scientific attitudes — and the steady expansion of science. During the 20th century, the scientific method not only became the catechism of school science classes, it was generalized across domains, from the laboratory to the factory floor. But, even as the scientific method seemed to summarize a new scientific approach to knowledge, the expansion of science engendered vigorous responses. On the one hand, there was a growing sense that science was a major threat to religious belief. On the other hand, there were groups ranging from literary and artistic figures to political and cultural movements that were concerned about the evacuation of moral thinking from American life. For some, Dewey's pragmatic and functional morality — in which matters of belief were subjected to simple experimentation — represented the biggest threat, while, for others, the rise of technology or even the growth in influence of figures like Freud, became the signs of a secular age that had lost its human ethos and its moral compass. Resistance to science circulated far outside the groups of uneducated Americans who were opposed to science because of their religious beliefs or because of a more general propensity on the part of Americans — noticed by Tocqueville a century before — to distrust experts, be swayed by conspiracy theories and remain sceptical about modern ways of life.

The real campaign against Darwinism in America did not begin until the 1920s, and it was about far more than the literal truth of Genesis. For many, as summarized by Andrew Jewett in his book *Science under Fire*, science came to be seen as authorizing "a misguided, dangerous view of humanity. It delivers material progress but also sows moral degradation" (Jewett, 2020, p. 4). As Jewett writes, "Since the 1920s, many other critics have argued that science poisons the wells of culture…. This style of argumentation spread especially widely after World War II, reorienting images of science as it did. In the 1950s and early 1960s, a remarkably broad array of mainline Protestants, humanities scholars, conservative political commentators, and even establishment liberals joined theological conservatives in arguing that science represented a moral, and even existential, threat to civilization." Increasingly, the term used to attack science was "scientism", which implied a scientific world view rather than, for example, the use of newly discovered penicillin and other antibiotics to fight infectious disease during the same years. Jewett goes on:"The postwar period, which we now remember as the 'golden age' of American

science, brought a society-wide reckoning with the place of science in modern culture. Critics of varied political and religious persuasions argued that even the horrors of atomic warfare paled in comparison to science's capacity to unravel the social fabric itself. Science, they contended, replaced the familiar view of human beings as moral actors with a new conception that ignored their capacity for moral choice and reduced them to the status of animals or machines." These concerns paved the way for, and were then exacerbated by, the political explosions of the late 1960s and 70s, when the military industrial complex — and in particular its expressions in the Vietnam war — was linked by radical theorists to big science and the growing influence of science and engineering in university life.

Historians of science such as Cowles and Jewett, as well as many other academic critics — scientist and non-scientist alike — have themselves insisted that science be detached from scientism. They have come to this view, however, not because of their own concerns about the lack of values in science, but rather because of the way they see science as being conducted in real life. Cowles writes that scientific authority is "undermined by a 'replication crisis' crippling confidence from within, while deniers of scientific consensus on issues ranging from climate change to vaccine schedules have compromised its image in the wider world. Debates over the nature and causes of these problems often center on the scientific method: on whether it is biased or a cure for bias, free from politics or fundamentally political, for better or worse." But he goes on to note that, "science has not always been 'a method only,' nor is method necessarily as flat as it seems. It is possible, as it was in the age of methods, to think of science as the flawed, fallible, activity of some imperfect, evolving creatures *and* as a worthy, even noble pursuit" (Cowles, 2020, p. 279). Jewett echoes these views when he writes that, "the challenges to scientific authority that have circulated in the United States since the 1920s are not wrong in every detail. Science is a messy, thoroughly human enterprise that does not, and cannot, address many of the issues we face. Indeed, most scientists share that assessment themselves" (Jewett, 2020, p. 260). He goes on to argue that, "[o]ver time, in fact, a more charitable and nuanced assessment of science might help us liberate researchers from the extravagant assertions of disinterestedness that envelop their work. It is not their claims alone, but also the arguments and actions of many other groups, that have trapped scientists in the cage of absolute value-neutrality. Critics often declare that science eschews considerations of value, in order to blame it for doing so. Some go farther, contending that science provides absolutely certain knowledge — not models, not probabilities, not calculations of risk — and must do so before we can act on it" (Jewett, 2020, p. 264). Like many other historians and sociologists of science, he notes that, "[t]his cycle must be broken if we are to recognize science for what it truly is: a thoroughly human practice like any other, yet that produces remarkable outcomes."

For some scientists, this kind of social historical lens — or what is sometimes called social constructivism — is seen as compromising scientific authority itself, predicated on the view that there is a fundamental difference between humanistic and scientific interpretation. Significantly, many social scientists, especially in the two decades after the Second World War, not only agreed with these scientists, but worked assiduously to model their own methods on strict objectivist views of science. Science gained greater authority during those years because of the increasingly fast pace of scientific discovery; as it did, so too did the idea that social science could only become authoritative through developing similar claims to objectivity, value neutrality and scientific modes of analysis. Economists were the most successful in this effort, though political scientists, sociologists, psychologists and even anthropologists argued vociferously about how best to make themselves into scientists. Meanwhile, many scientists were sceptical about the epistemological claims of social science, worrying that these upstarts would compromise the efforts of "proper" scientists to maintain public support for and acceptance of their own work. Indeed, when student protestors attacked science in the agitations that developed around Vietnam, they found it even easier to go after a social science that seemed to them to embed American ideas of global superiority into models like modernization or underdevelopment theory.

Scepticism about science has grown steadily along with scientific advances. With every new drug or technology or weapon that seemed to promise a world entirely transformed by science, additional reasons to worry that science itself is the problem rather than the cure have also emerged. In recent years, the increasingly visible evidence that climate change is now permanently altering our planet has raised concerns on the part of some that the modern industrial age has forged the seeds of our planetary destruction, even as the promise of digital technology has brought with it growing worries about security, privacy and levels of disinformation that threaten democracy itself. And during the Covid-19 pandemic we have witnessed both the almost miraculous capacity of science to develop effective vaccines in record time and the deep resistance to public health measures ranging from wearing masks to taking the new vaccines.

The task of countering the widespread resistance to scientific knowledge on the part of the general population, both in the U.S. and globally, is daunting, and well beyond the scope of the present paper. My main point here is that this task is not made easier by the perpetuation of the two cultures delineated by Snow and still very much present on college campuses across the country. Snow's critique continues to be relevant, even if the place of science in universities has changed dramatically since the 1950s. As science has become increasingly central, however, securing greater and greater funding in the decades after the war than it had been earlier in the century, the humanities

began their slow decline. Whereas in the immediate years after the war the humanities maintained a central place in college and university curricula, they have increasingly entered a crisis mode. Today, there is a general view that they are both largely irrelevant to contemporary life and not well suited for preparing students for actual skills and careers. There are still high barriers to programmes — and careers — in STEM fields, but these are mostly rooted in the social, political and economic conditions that compromise pre-college educational opportunities for young people without significant social support, making it very difficult for many deserving youth to succeed in the hard work of preparing for college level STEM courses. In the years after the Russian launch of Sputnik in the 1950s, there was a big if short-lived push to stress the importance of education in science and technology. Now that science and technology have penetrated virtually every aspect of life, however, young people understand they need to understand fields in science and engineering — and increasingly computer science — in order to find jobs for careers of virtually every kind.

The loss in prestige of the humanities has been part of a general critique of the university, itself driven by concerns about cost as well as relevance. Rising levels of student debt have coincided with a time when career opportunities in non-technical fields have declined, making the liberal arts appear to be at best a luxury, at worst an expensive waste of time. They have also been attacked for enshrining ideas of western civilization or American culture that give no place to the voices of the oppressed, whether because of histories of imperialism, slavery or capitalism. And when universities have changed curricular requirements and options in response to concerns about civil rights, feminism, gay rights, ethnic studies, etc., they have in turn been critiqued by those who see the liberal arts as advocating values that are not in synch with their own. Intellectual movements in the humanities that stressed the role of interpretation, most conspicuously post-structuralism, deconstruction and post-modernism, but also theories that argue for the "social construction" of reality (including science), have been judged by some as undermining the authority not just of science but of the humanities as well. The trope of the "English major" has too often become a joke in popular culture, even as the understandable political interest in providing college level skills across the population to prepare for jobs in the future has conspicuously shunted aside any serious conversation about the larger purposes of higher education. And yet, whether we look at the current threats to democracy or at the dangerous uses of technology, or even at the politicization of public health, we tacitly acknowledge that we need education for reasons that go well beyond the technical needs associated with career readiness.

Ironically, therefore, at a time when the culture of science is clearly in the ascendant — when C. P. Snow's vision for the future has in some respects

come to pass — science needs the arts more than ever. Regrettably, however, the two cultures have become in some ways even more incomprehensible to each other. The humanities have understandably become more defensive about their place in the university — especially given the constant threat of downsizing due to lower enrolments and numbers of majors — resisting the sense that they become mere "service" fields for STEM fields. In hunkering down with an eye to weathering the storm, disciplines in the humanities and humanistic social sciences have too often retreated inside their disciplinary shells. They have fashioned their undergraduate curricula after their shrinking PhD programmes, teaching courses that are too tied to their own specialized research areas, and sponsoring research that preserves disciplinary boundaries rather than venturing into larger, if riskier, arenas that might invite a broader conversation between discrete fields within the "arts" on the one hand and between them and the sciences on the other. As the sciences have become more specialized, they have also created more barriers for exchange, although there is a new openness to interdisciplinary collaboration that is related both to the explosion of knowledge in the biological sciences and the needs for science to develop ever more advanced forms of technology for measurement, imaging and exploration. Some scientists in cutting-edge fields, gene editing for example, have expressed the need for greater attention to ethics and the social consequences of science (see Isaacson, 2021, pp. 333-370), while computer scientists have become increasingly concerned about questions of privacy as well as security. This has translated only rarely into the structural reorganization of programmes and departments, which continue to reflect the categories and protocols of knowledge at the turn of the last century more than they do the forms of knowledge appropriate for the 21st.

The current pandemic has brought these issues into even sharper focus. There is a newfound respect for schools and departments of public health, where scientists have for years collaborated with social scientists to work on questions ranging from the epidemiology of infectious disease to the social factors surrounding health. While virologists and vaccinologists have done pathbreaking work — with the most spectacular results emerging from the use of mRNA for the first time in successful vaccine development — we are now witnessing the extent to which science is resisted by many segments of the U.S. population. We see vaccine resistance from blacks and other minorities who remember the abuses of the Tuskegee syphilis experiment, and from rural white men whose distrust of experts has been exacerbated by the politicization of science by the Trump administration and other right-wing voices in public life, as well as on social media. The ranks of "anti-vaxxers" have also, however, been made up of people across the political spectrum who invoke a wide range of bogus arguments against science, including the continued insistence by some self-styled scientists of correlations between autism and

vaccines. The current debate among scientists and public health officials about reports that the Astra Zeneca and Johnson & Johnson vaccines have in rare instances produced blood clots has only added fuel to vaccine resistance, despite the vast difference in actual risk between, say, taking a vaccine, and going out for a ride in an automobile.

While the case for the importance of vaccines is a clear demonstration of scientific accomplishment, the emergent crises around climate change provide an equally salient example of the need to accept certain levels of indeterminacy and uncertainty in a developing consensus among serious scientists about trends, correlations and future prospects for the planet. As scientists and policy experts develop common understandings of some of the steps we need to take to ameliorate the dangerous effects of massive fossil fuel use over many decades, the task of explaining "the science" behind all this has become increasingly challenging. When there are dramatic — and concrete — facts to point to, the job is easier, but — as was the case with initial projections about the likely trajectory of Covid-19 as well — much of climate science depends on knowledge that derives from models that are inherently as much about ways of "interpreting" data as they are about the data themselves (see Koonin, 2021). The popular understanding of science as somehow exempt from the human history of discovery makes it all the more difficult simply to "follow the science." Science proceeds not only by the necessary if also serendipitous intertwining of observation and experiment, but by the zigs and zags — the debates, arguments and disagreements — that are vital components of all human knowledge, even the most fact-based. While there are indeed a host of "facts" that make up the fundaments of scientific (and other) knowledge, these facts frequently only make sense when united through interpretive frames and narratives, with the extensive use of the kind of imagination Darwin himself had to invoke to piece together the fragmentary evidence of natural evolution.

While we need to improve the ways in which we communicate the findings of science to the public (whether by scientists, academic or public officials, journalists, etc), the public face of science begins where science is made and taught, especially in the research universities that sponsor high-level research and train advanced students in a broad range of scientific fields. At the very least, it should be possible to use the current public crises around science to encourage greater attention within our universities to bringing the two cultures together. I'll conclude here by reviewing a few initiatives that I commenced at Berkeley when I was Chancellor, before making a few modest proposals for additional avenues to explore. One of the first investments I made in programme development was in neuroscience, a cluster at Berkeley that was under-resourced but uniquely cross-disciplinary in its focus on cognitive and brain science in fields ranging from biology to psychology to new

imaging technologies. We had the advantage of working closely with the clinical neuroscience group at UCSF — the University of California's flagship and free-standing medical school — but Berkeley had deliberately taken advantage of its core strength in engineering to supplement its own excellent, if boutique, neuroscience research cluster. Compared to Columbia, where I had been before coming to Berkeley, the group was small, but not only did it take full advantage of the university's great strengths in engineering, it was nimble as it grew by establishing new connections. When a donor appeared, who wanted to connect the work of neuroscience to an interest in Buddhist meditation, the group was ready and willing to do so.

I initiated a far larger effort to bring together teaching and research in computer science and statistics with schools and departments across the university. In the first instance, the impetus for this was the flood of students wishing to take courses in computer science. One of the first meetings I had was with the chair of the department who provided me with enrolment data and then a proposal to double the size of the faculty. We could not do that even if we wanted to, but the larger question was how to teach computational skills in ways that would connect with discrete forms of knowledge that students were actually studying in college. We convened a committee made up of faculty from across the university — from computer science and statistics, to be sure, but also from physics, public health, computational biology, urban studies, philosophy, history and literature — and asked them to design a new set of data science courses across the curriculum. They succeeded brilliantly in fashioning both a core data science course that introduced students to computational methods and modes of thinking alongside a set of "plug-in" courses that would connect those methods to data sets and questions emerging from other fields. For example, students in public health could use data science to analyse epidemiological data about the spread of the Zika virus; students in history could analyse mortality data around pandemics such as the "black death;" and students in literature could study debates over authorship and Shakespeare by evaluating word use patterns across multiple texts that could provide quantitative clues for important disciplinary questions. The courses were wildly popular and have now spawned a new "Division" of Data Science, the fastest growing "concentration" for undergraduates, and a new recognition on the part of faculty of the ways in which they can work together across departments to create both opportunities for students and innovative ways to advance the work of the disciplines across the arts and sciences. Coincidentally, it appears that technology companies often prefer students with these kinds of broad interdisciplinary backgrounds when hiring recent college graduates: the students know both the basics of computer science and of other fields that use real world data and provide serious contextual knowledge about the data sets as well.

Even as I encouraged the computer scientists working in areas such as machine learning and artificial intelligence to build into their programmes more attention to questions around ethics, bias and social impact, I realized I only began an effort that has so far been largely limited to interdisciplinary research centres rather than curricular and programme reorganization. It has become increasingly clear that algorithms are no more neutral than any other kind of text, and that even when they are designed without any intention to introduce bias they do so both because of unconscious bias and because they encode social biases through analysing large data sets from the outside world (see, e.g., West, Whittaker & Crawford, 2019). Addressing these issues not only demonstrates an urgent need for the analytical tools of the humanities along with those of computer science, they provide a clear example that could be used for collaboration both in teaching and in research. What would happen if an English major could take courses (for credit in their major) on digital literacy?

These are not merely academic questions. Indeed, technological discoveries are decidedly outpacing our advances in evaluating the social, economic and ethical implications of these new technologies. Here one can point not just to new areas of exploration, but standard philosophical puzzles that suddenly take on urgent real-world meaning. For example, the standard "trolley problem" in moral philosophy turns out to be relevant to designing self-driving "autonomous" vehicles. The trolley problem refers to a host of "thought experiments" that pose questions such as how to choose — should one be the conductor of a trolley — whether to avoid hitting a person (that one might know, or is young, etc.) if the alternative is to hit and possibly kill a greater number of people (that one may not know, who are older, etc.) What once were abstract questions become salient when writing code for self-driving cars, not just for reasons of moral choice, but even for insurance companies that might have to assume liability not for the actions of drivers but for the decisions of coders.

Questions of ethics circulate not only around the use of new digital technology but also around the development of new medical techniques and procedures. Jennifer Doudna did her pathbreaking research on CRISPR-Cas 9 at Berkeley, but no sooner had she and a group of colleagues extended the uses of "gene editing" to human RNA than she called for the development of ethical guidelines and protocols for any human application. In 2015 she helped convene a conference of leading biological scientists to explore the ethical implications of her scientific breakthrough. While most scientists said that they were in favour of the use of the technique to cure disease, and against its use for any kind of human enhancement, she was quick to point out that there is a murky boundary between these two goals, using examples to show how much this distinction could be difficult to make in practice. It

was clear to her that scientists had to work with humanists to think about these challenging questions.

CONCLUSION

These are just a few examples to demonstrate both the need, and the importance, of bringing the two cultures of the arts and sciences not just into greater alignment, but ultimately into a larger, shared culture of intellectual inquiry, moral evaluation and technical as well as scientific experimentation. Universities must lead the way. Once they do, the daunting task of communicating science to the public may not be easier, but it will at the very least be predicated on understandings of the relationship between truth and facts, knowledge and interpretation, discovery and wisdom — art and science — that will perforce play a critical role in making the work of science both more effective and more persuasive.

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CHAPTER 3

The university in the age of platforms and algorithms

Karen Maex & Matthias Bakker

INTRODUCTION

This paper argues that the rise of platform companies and their use of algorithms require a response that acknowledges the public value of universities in order to guard their academic freedom and independence. Digitisation offers immense opportunities for scientific progress. But whereas in previous eras technology served to amplify and exchange scientific ideas and university values, the age of platforms and algorithms raises uncomfortable questions about the very being of the university.

The rise of platform companies and the intensive use of algorithms impair the function of universities as a fifth power: as a keeper of a common culture of knowledge and an agent of new knowledge.

Platforms alter the architecture of the current knowledge system and have a large impact on research and education processes. The use of algorithms by platforms has far-reaching effects on what knowledge means and how knowledge is disclosed. Ultimately, this undermines the role of universities as creators and keepers of a global, common and independent culture of knowledge.

This paper addresses, after a short historic reflection, the ways platforms and algorithms shape research and education. It also explores potential solutions to address these challenges.

A SHORT HISTORY OF THE KNOWLEDGE SYSTEM

In the year 48 BC, the celebrated library at Alexandria was destroyed by fire. Its vast collection of manuscripts, maps and drawings was reduced to ashes. This disaster continues to capture our imaginations even today, almost 21 centuries later. The historical importance of the organization of knowledge over the centuries has been discussed and analysed at length by McNeely (McNeely & Wolverton, 2008).

Since the inception of libraries, preserving knowledge and making it widely available have been their core purpose. In the Middle Ages, monastic communities played an important role, taking on the laborious task of writing and copying out texts. In doing so, they played an active role in the development of knowledge. Over the course of the 12th and 13th centuries, monasteries lost some of this responsibility to universities. Students and teachers gravitated to cities like Bologna and Paris. The amalgamation of the guilds for students and teachers gave rise to the education guild, the *universitas*, which represented their shared interests. The universitas model quickly spread and universities came to occupy a central position as places of independent knowledge, research and learning.

With the introduction of printed books in 1455 and subsequent proliferation of texts both old and new, university libraries took an increasingly prominent role in the knowledge system. As well as gathering and disseminating knowledge in the form of texts and books, university libraries were concerned with gathering existing and new writings and furnishing them with context, notes and cross-references.

Existing knowledge was thus meaningfully integrated with new knowledge thanks in large part to university libraries. They performed a fundamental and determining "networking function". As both the sheer amount of knowledge and possibilities for knowledge dissemination grew, large new public libraries began to emerge and extended their important public role for society at large.

Since the 1980s, the pre-eminent role of libraries has gradually been eroded, initially by the development of advanced knowledge systems in commercial publishing. Instead of owning works in their collection, as in the days of printed editions, now university libraries only have licences granting rights of use. Publications on university research in effect have to be "bought back" through subscriptions to expensive journals in order to make them available through university libraries. That means publishers have taken an important position in the access to knowledge.

Academic publishing is currently undergoing a major transition. Big publishers are moving from a content-provision to a data analytics business. The products that they are selling to higher education institutions are expanding beyond journals and textbooks to include research assessment systems,

productivity tools and online learning management systems. These services offered by publishers and other companies constitute complex infrastructure that is critical to conducting the end-to-end business of the university.

Companies are moving to capitalize on data, for example about students, faculty, research outputs and institutional productivity. Through the seamless provision of these services, the providers invisibly reduce the strategic room in key university responsibilities, taking advantage of the decentralized nature of academic institutions (Aspesi *et al.*, 2019, p. 5.).

THE UNIVERSITY IN THE AGE OF PLATFORMS AND ALGORITHMS

The rise of platforms and the loss of interoperability

Digitisation brings about fundamental changes in the way universities perform research, deliver education and disclose knowledge. This presents new fundamental challenges which are based on the premise that the digital does not constitute a parallel world but intervenes in a fundamental way with the underlying processes. With the rise of big platform companies and the abundance of algorithms, the context in which universities work has changed dramatically.

What are platform companies? José van Dijck *et al.* define the following characteristics of platform companies; (1) they automatically gain enormous amounts of data from their users, (2) they provide access to data to third parties through Application Programming Interfaces (API's), (3) they process user data with algorithms, (4) they constitute economic configurations that couple services and ads to specific users (Van Dijck, Poell & de Waal, 2016, pp. 17-20).

Platform companies thrive on data. Digital markets are different from previous product markets in the sense that there are strong returns to scale and scope in the possession of consumer data. The more data a platform has, the easier it is to generate revenues and more data and so on. (Fukuyama *et al.*, 2020, p. 28). Another key characteristic of platform companies is that they are based on intra-operability instead of interoperability.

Companies such as Microsoft, Apple and Google have their own digital ecoystems or platforms in which their services are seamlessly connected. With a Google identity, you are able to log in to email services, maps and countless other Google services. A closed digital ecosystem offers user friendliness and ease. It also results in user and vendor lock-in. As opposed to intra-operability, interoperability allows users to switch between services. The use of "cloud" and "software as a service" increases the dependence of educational institutions even further.

In addition to publisher's products, universities use all types of digital technologies such as digital learning environments, video conferencing tools, plagiarism detection tools etc. Looking at larger companies, many researchers now use Google Scholar to find their h-index, Google Docs to collaborate with colleagues, Google Dataset Search to track down research data and Amazon cloud services to do calculations and store data. In the Dutch context, Microsoft is also a major player providing office, collaboration and videoconferencing tools to almost all universities.

Universities increasingly buy digital products instead of developing their own digital infrastructure. At Dutch Higher Education Institutions, the percentage of applications hosted internally has dropped from 43% to 13% from 2016 until 2020, making the percentage of externally hosted and cloudbased services 87% in 2020. These developments make switching to other providers difficult (Bok *et al.*, 2021, p.6, p. 28). Continuing on this pathway practically forces universities into a vendor and user lock in. Universities run the risk of being trapped, marginalized and feudalized in platforms driven by profit.

How algorithms shape the academy

Besides the loss of independence or choice, there is more at stake. The transfer to digital applications does not create a parallel world, but essentially a new environment. The digital increasingly *shapes* the real world (Amoore, 2020, p. 4, p. 7). Through the use of digital technologies, platform companies that offer these technologies have become a driving power in the design of our universities themselves (Van Dijck, Poell & de Waal, 2016, p. 13). This is called "governance by platforms" by Tarleton Gillespie (Gillespie, 2017). Universities have become dependent on dominant platform companies that define and adapt the architecture of the university without universities having influence on that.

Platforms rely on algorithms. The essence of algorithms is that they "afford greater degrees of recognition and value to some features of a scene than they do to others" (Amoore, 2020, p. 8). Algorithms are de facto by definition discriminatory: they necessarily discriminate to have a meaning in the world. Louise Amoore argues that algorithms create the "bounded conditions of what a democracy, a border crossing, a social movement, an election or a public protest could be in the world" (Amoore, 2020, p. 8). The same holds for algorithms and universities. Algorithms increasingly shape the way universities conduct research and education.

Publishers, for example, control current research information systems in which university staff register their research output, control the journals in which researchers publish and build research information services on top of those to measure research performance or predict which fields of research topics are promising or likely to receive research grants based on algorithms.

This might lead to an unwanted shift in research focus based on untransparent algorithms. In analogy it might be more rewarding for researchers to publish in a journal that is counted in a research performance tool owned by the same company instead of another journal that is not. Potential biases included in the algorithms could also shape a decision of a funder to hand out a grant to a research proposal.

In higher education, three fields of application of algorithms can be distinguished: institutional applications, student support applications and teaching applications. Institutional applications are used to make predictions of student enrolment, student recruitment, education logistics (class sizes, rostering and curriculum planning), and "study success". Student support applications are used to advise students on study loads, study choices, study progress, study paths and for early warning systems. Teaching applications are used to personalize education, including learning analytics and grading robots.

The quality of prediction and decision-making by algorithms is dependent on the quality of data and the ethical use of these data. Expired data, incorrect or non-representative selection of data lead to incorrect predictions of certain groups of students. For example, racial categories in "algorithmic fairness frameworks" that incorrectly consider race as an attribute of a person instead of a social and institutional construct. Machine learning uses large sets of existing data to make predictions, clustering and pattern recognition. When the training data contain prejudices or unethical opinions against groups or individuals, these prejudices will be reproduced in the output. Applications of machine learning are also based on correlation and not causal models, which can lead to false conclusions (Van Baalen, Kirschner & Volman, 2021, pp. 27-29).

By handing over decision-making in education through such algorithms, the academy loses part of its academic independence. This responsibility cannot be handed to for-profit companies. The algorithms used by providers that service universities are notoriously untransparent and can often not be questioned or contested.

The disappearance of a common culture of knowledge

An additional problem of the rise of platforms and the use of algorithms is the disappearance of a common culture of knowledge. One of the promises of AI is personalized education. Personalization can be helpful, but it could also hinder creating a common culture of knowledge if every individual student has their own unique education (Van Baalen, Kirschner & Volman, 2021, p. 29). We have recently seen many examples of how so-called "social media" can polarize political landscapes through filter bubbles and undermine a common democratic culture. This is orthogonal to the essence of academic education.

In addition to algorithms jeopardizing a common, cultural knowledge base as a result of a similar learning experience, the lack of interoperability of platforms also obstructs the creation of a common knowledge base. Universities are focused on exchanging ideas and knowledge. Individual universities contribute to a global common knowledge base, in that sense universities are based on interoperability. Platforms are based on the exact opposite because their business models are based on intra-operability.

Platform companies are in fact silos of "knowledge" and alternate "realities". These words are put in between brackets because the business models of companies that dominate the digital are based on profit, they do not ultimately care for facts (Zuboff, 2021). This neglect challenges the *raison d'être* of universities in their pursuit of knowledge. If there are so-called alternative facts that can be distributed just as easily and are perhaps more profitable, there is little use for universities. Algorithms can also have far-reaching effects on what knowledge means and how knowledge is created.

Algorithms create strains of thoughts and can undo creative thinking and learning. Algorithms for example could impede serendipity and originality in scientific thinking, the phenomenon where one stumbles on scientific breakthroughs by chance.

Another problem is what Shoshanna Zuboff calls epistemic inequality, the growing information gap between platform companies that know virtually everything about people, and public institutions that know significantly less about platform companies (Zuboff, 2020). Through student analytics, Google, for example, knows significantly more about the performance of pupils than our schools or governments do. The workings of platform companies are hidden and can be perceived as arbitrary.

GUARDING ACADEMIC INDEPENDENCE IN THE AGE OF PLATFORMS AND ALGORITHMS

What can universities do to tackle the issue of platformization? Three paths of solutions are explored. These are legislative action, building public infrastructure and procurement collectives and principles.

Legislation: a 'Digital University Act'

The European Commission as part of its digital strategy, is putting out a series of digital legislation to counter the dominant position of large platform companies, to stimulate data exchange and mitigate the risks of using Artificial Intelligence. In 2020 and 2021, the Commission has or will put out the Data Governance Act, the Digital Services Act (DSA) and Digital Markets Act (DMA), the Artificial Intelligence Act and the Data Act.

In a briefing preceding the presentation of the Digital Service Act, Commissioner Margrethe Verstager stated:

> We can't just leave decisions which affect the future of our democracy to be made in the secrecy of a few corporate boardrooms. That's why one of the main goals of the Digital Services Act that we'll put forward in December will be to protect our democracy, by making sure that platforms are transparent about the way these algorithms work — and make those platforms more accountable for the decisions they make. (Verstager, 2020)

The digital acts presented by the European Commission have different scopes. The Data Governance Act is focused on making data-sharing easier and provide an alternative for closed data platforms. The Digital Services Act proposal introduces new rules on how online marketplaces and content hosting platforms deal with illegal content, including special transparency and auditing obligations for very large platforms.

One of the obstructions to ensuring transparency of algorithmic systems is the lack of access to the data that watchdogs need to scrutinize how very large platforms target, moderate and recommend content or services to their users. Under the proposed rules, large platforms will be required to make available Application Programming Interfaces (APIs) that include information about advertisement content targeting criteria (Nelson & Reinhold, 2020). The Digital Service Act also seeks to enforce access to large platforms for researchers. This is a very important element to tackle the issue of epistemic inequality between the all-knowing platforms and the rest of society.

The Artificial Intelligence Act introduces a risk pyramid in assessing the use of AI, ranging from minimal to limited, high and unacceptable risk. AI systems used in education or vocational training for determining access or assigning persons to educational and vocational training institutions or to evaluate persons on tests as part of or as a precondition for their education, should be considered high- risk, according to the current text.

Although these regulations aim to create a level playing field, they do not sufficiently do so for universities. Indeed, the acts seem to evade universities. A "Digital University Act" would fill that gap by providing public control over research output, enabling access to platform data for research purposes, guarding interoperability and data portability, and maintaining public control over authentication and accreditation in higher education.

One way forward is to recognize universities as having a distinct public value and as critical infrastructure like other processes and services deemed so vital for society by government, that their disruption could lead to severe societal disruption. Access to electricity, internet, drinking water and payment services are examples of vital processes. It can be argued that protection

of and access to scientific knowledge as well as provision of education are of vital importance for society.

A new public ecosystem: building public infrastructure

In addressing the challenge regarding the activities of big platform companies, investments are essential to create a level playing field in view of the massive impact of private companies. National and European investments in building this public infrastructure will therefore be crucial.

Universities have already taken initiatives regarding open journal platforms. Among others, the University of Amsterdam is working together with other partners on a publication platform for research output. This University Journals platform offers an alternative to the current journal ecosystem. Linked to university repositories, University Journals publish reviewed articles, data and other academic works on an accredited open access platform. The University Journals platform is owned by the university community and offers Open Access journal publications to researchers affiliated to its university partners.

Besides publicly owned publication platforms, we also need a public infrastructure for metadata of research output. In the Netherlands a feasibility study on an open knowledge base for the Dutch research community has been carried out. An Open Knowledge Base is meant to maintain all metadata for research output from Dutch universities, metadata that is currently being managed in discrete, unconnected, closed, commercial systems. An Open Knowledge Base will as such provide a richer database for all public stakeholders. It will separate services from metadata. The latter would create a level playing field for service providers. Currently, commercial parties control both the metadata and the services, creating oligopolies.

The sharing of data among researchers in an early stage of their research is key to the research process. An example of an initiative that contributes to a new public ecosystem is the Research Data Exchange. The University of Amsterdam and SURF, the Dutch ICT organization for higher education, are developing a Research Data Exchange tool to share data without the data leaving its current environment. The goal of the tool is to maintain data sovereignty by regulating access to the data. The data holder decides which data to share with whom and under what conditions. For example, before agreeing to give access to data, the data holder is able to run the algorithm of another party on the data and check the outcomes. The Research Data Exchange will be developed as an interface that can be added to existing repositories.

Besides initiatives on the local and national level, European initiatives are essential. The European Open Science Cloud (EOSC) is envisioned by the European Commission as a supporting landscape to foster open science and open innovation. The EOSC is a federative infrastructure based on

infrastructure of various countries, universities and scientific communities that supports the open creation and dissemination of knowledge and scientific data.

Procurement collectives and principles

To provide a counterweight against big platform companies, it makes sense for universities and other public organizations to work together in procurement collectives, to bundle expertise on procurement and define procurement principles. Dutch universities have already taken an initiative to negotiate with large academic publishers collectively. However, a collective approach is currently lacking in the procurement of other tools and services that universities use in education, research and operational management. One example is plagiarism software, another example is research information services.

We should realize that there is an emerging market for third party providers offering services to satisfy the growing demand for research information and evaluation. Increasing amounts of data are being collected on all aspects of the research lifecycle into a variety of systems and platforms. Using large-scale data collection, aggregation and analysis, these services provide new prospects for assisted decision-making, for example on funding opportunities, publishing venues, identifying upcoming research fields and alternative metrics. As critical functions of the scholarly enterprise become increasingly dependent on such services, it is necessary that the academy itself carefully considers risks involved in becoming too dependent on specific market players and their tightly integrated solutions.

To address issues around the responsible use of research information and the role of commercial third-party providers in particular, an expert taskforce was established in early 2020 by the Association of Universities in the Netherlands (VSNU), The Netherlands Federation of University Medical Centres (NFU) and The Dutch Research Council (NWO). The Dutch Taskforce on Responsible Management of Research Information reflects on the responsible management of information services and the avoidance of undesired network or platform effects.

The taskforce has composed the principles below with regards to procuring research information services. These principles could provide inspiration for drafting principles in other important public fields as well. These principles are 1) trusted and transparent provenance, 2) openness of metadata 3) openness of algorithms, 4) enduring access and availability, 5) open standards & interoperability, 6) open collaboration with third parties and 7) academic sovereignty through governance.

These principles are based on the premise that research metadata are part of the public domain, should be available enduringly and should be governed by public institutions. Research metadata underpins decision-making

processes in many aspects of university life. To ensure fair and accountable decision-making, the provenance of that scholarly information needs to be public. This provides accountability to all stakeholders affected by such decision-making processes. "Black-box" algorithms inhibit transparent, fair decision-making. Standardized scholarly metadata that is accessible and separated from associated services and tools allows for competition without platform or vendor lock-ins (Bijsterbosch *et al*, 2021).

CONCLUSION

This article argues that the rise of platform companies and their use of algorithms constitute a challenge to universities as a fifth power: the university as keeper of common culture of knowledge and agent of new knowledge. We have argued that through the use of digital technologies, universities have become dependent on dominant platform companies that increasingly shape academic activities.

The omnipotence of platform companies does not only force universities in lock in situations, the use of algorithms also intervenes in education and research processes themselves. The use of platforms and algorithms can jeopardize a common culture of knowledge. The lack of inter-operability of platforms creates silos of knowledge and personalized education can undermine a common learning experience. This threatens the existence of a common knowledge culture to which universities contribute.

This state of matters requires a response from universities and society. In addressing the challenge of platform companies, we argue that part of the solution is (1) legislative action. Current digital legislation seems to evade universities. Legislation is needed to recognize the public value of universities and is instrumental in guaranteeing academic independence in the age of platforms and algorithms.

In addition (2), there is a need to set up a publicly owned federative digital infrastructure. This requires significant public investments on a national and European scale. And lastly (3) universities and other public organizations should work together in procurement collectives, bundle expertise on procurement and define procurement principles.

EPILOGUE

Universities carry a large responsibility in communicating and disseminating the knowledge they create. The rising importance of platforms in the academic activities of universities is not our only concern. The ecosystem in which we serve society is changing as well, such as the dissemination of

independent knowledge to the wider public. In times where the information ecosystem and communication business are based on private platform companies as well, the science dissemination system that we, as a society, have developed through university libraries and public libraries will disappear unless we set up a new public library system in a level playing field with public and private players.

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CHAPTER 4

Silent Spring Revisited: the Relevance of Scientific Communication in Combatting Environmental and Climate Change

Ivanka Popović

INTRODUCTION

Rachel Carson's book *Silent Spring* (Carson, 1962) had a global impact on the use of pesticides. It is an excellent example of how scientific communication influenced public opinion and led to the responsible use of biocides. In the meantime, science and technology have undeniably contributed to the advancement of the quality of life. However, there have also been issues, such as various kinds of pollution that have antagonized part of the population towards science in general. The increasing mistrust in science by some, not exclusively the uneducated, has impacted the position of universities and their researchers.

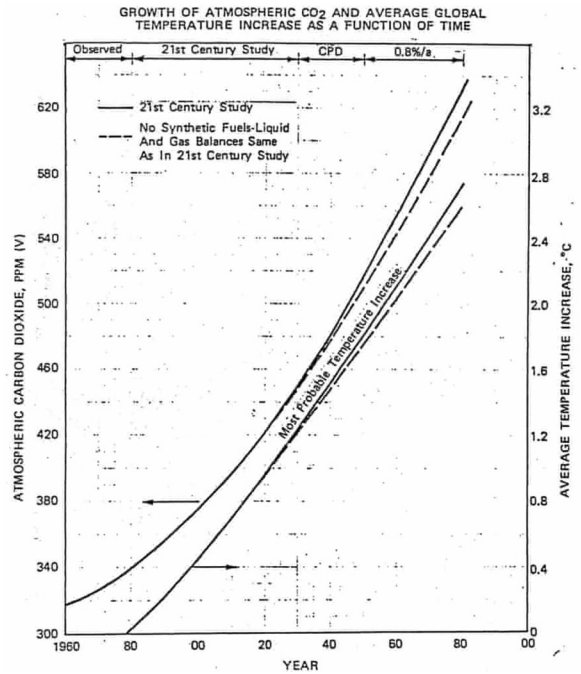
Even though universities are endevouring to change the public's perception of them as "ivory towers", the transition does not seem to be happening rapidly enough. Unfairly, academic research, especially blue-sky research, is often seen as a playground for out-of-touch scientists. Recent events regarding the development of Covid 19 vaccines have actually disproved this perception. A year after the discovery of the Covid 19 virus, several different vaccines

have been developed, based on the results of decades of publicly funded biomedical research (Thomas & Colin-Jones, 2021). So how can universities change public opinion? Which topic can be singled out as a global challenge affecting everyone, regardless of their societal and individual circumstances? I believe that climate change is an issue that could be a litmus test for academic institutions to rebuild public trust.

Just as Rachel Carson was faced with backlashes from pesticide manufacturers and as the tobacco industry campaigned strongly to diminish the impact of smoking on human health (Jaslow, 2011), we are now faced with a similar situation with fossil fuel producers and other industrial polluters. I suppose that it will take time to fully accept that the combustion of fossil fuels is disrupting life on our planet.

Some large oil companies carried out internal assessments of the carbon dioxide released by fossil fuels and foresaw the planetary consequences of these emissions (Keane, 2020). In 1982 Exxon predicted that by about 2060, carbon dioxide levels would reach around 560 parts per million, two times more than at the pre-industrial level, which would increase the planet's average temperatures by about 2°C above the levels of that period (and even more compared to pre-industrial levels) (Franta, 2018).

Figure 1



In 2016 the Center for International Environmental Law claimed that Humble Oil, one of the predecessors of ExxonMobil, had been aware of the increase of carbon dioxide in the atmosphere since 1957 and that the increasing amounts would lead to global warming, but the company denied the allegations (ExxonMobile Climate Change Controversy, n.d.) Together with other large oil and coal producers, they advocated climate change denial internationally. These activities were targeted toward a) preventing ratification of the Kyoto Protocol by the U.S., b) undermining public opinion about the scientific consensus that global warming is caused by the burning of fossil fuels and c) opposing greenhouse gas emission regulation.

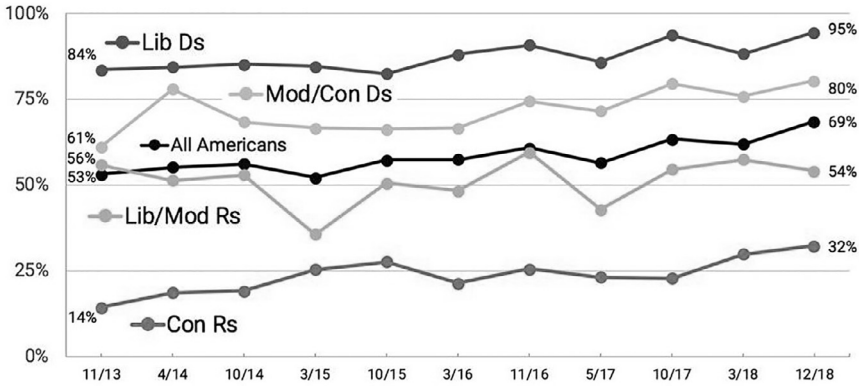
As so much of our current standard of living is dependent on the use of fossil fuels, public acceptance of the effects of these fuels on global warming is accompanied by fears that sacrifices need to be made at the personal level to provide a sustainable future. Albert Schweitzer claimed that "Man has lost the capacity to foresee and to forestall. He will end by destroying the earth." What was thought to be an exaggeration now seems to be ominously true.

The Volkswagen emissions scandal in 2015 (Volkswagen emissions scandal, n.d.) is a good example of how commercial interests can downplay subsequent environmental impacts. Even though VW's stock prices plummeted as the investigations started and many legal processes are not yet finished, what is the actual outcome? On the one hand, Volkswagen definitely suffered financial consequences. On the other, many subsequent polls show that the majority of consumers still believe in Volkswagen and that other carmakers are equally guilty of manipulation and that many think the scandal was exaggerated (Hennessy, 2015).

PR campaigns obviously play an enormous role in affecting the public perception of events. The public is overwhelmed by all kinds of (mis)information coming from various sources. And then, there is the matter of politics. Climate activism is a movement that is international and knows no borders, while the nationalist narrative is gaining ground in domestic politics around the world. Competitive nation states represent the opposite to the climate movement's emphasis on global human solidarity. These conflicting trends annul the obvious common benefits of controlling global warming and the development of a green economy. The UN Climate Change Conference, COP25, in 2019 brought widespread disappointment that no overall consensus was reached on increased climate commitment. These differences in opinion may become a defining feature of politics, with the nationalist right facing a coalition of climate-oriented voters comprised not only of traditional environmentalists, but also of those from the social-democratic centre-left and the traditional centre right (Dervis, 2020). This phenomenon is already happening in some countries in Europe.

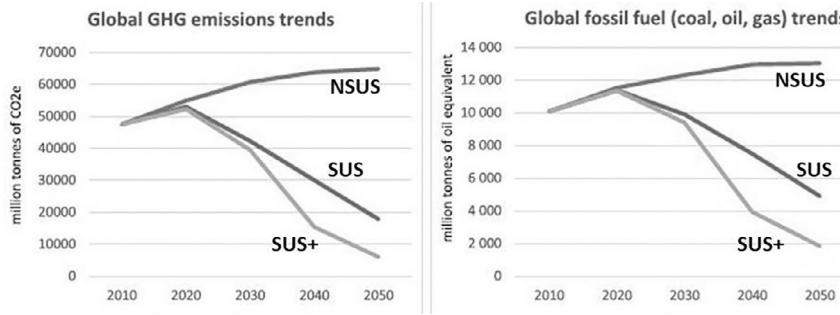
Believers in climate change caused by human activity vary depending on many demographic factors such as political affiliation, gender, race, level of education, etc. An interesting example is the difference in the concerns about global warming in the U.S. between conservative Republicans and liberal Democrats. But another trend may also be seen. The fraction of conservative Republicans worrying about global warming has increased more than two-fold in the period 2013-2018 from 14 to 32% (Gustafson, Bergquist, Leiserowitz & Maibach, 2019).

Figure 2



In her public appearances the young environmental activist Greta Thunberg regularly calls upon science to back her claims: "Don't listen to me, listen to the science. " (Volcovici, 2019). Is that enough? For example, can the results of modelling global trends be used to convey impacts of climate change? One such study published in 2020 will be presented as an example (Philippidis, Shutes, M'Barek, Ronzon, Tabeau & van Meijl, 2020). The study employs a global economic simulation model that combines rational market behaviour with environmental constraints and is further extended with an SDG metrics module. The model implements three world visions: a non-sustainable transition path, NSUS, and two sustainable pathways, which limit temperature rises to 2°C and 1.5°C above pre-industrial levels by 2100, designated as SUS and SUS+, respectively. The NSUS scenario assumes that progress is purely driven by market forces and technology change, with no additional climate agreements beyond 2017. SUS and SUS+, the more profound energy balance transition pathways include: a) increases in energy efficiency to decouple economic growth from energy consumption, b) the shifting of energy carriers toward electrification and c) decarbonization of energy through the adoption of (bio)renewables.

Figure 3



The results of the modelling reveal the following trends. A "non-sustainable" world reveals tradeoffs between economy and biosphere SDGs, with population growth of particular concern to a safe planetary operating space in the world's poorest regions. Sustainable visions lead to the reduction of natural resource pressures and emissions and meet energy requirements at potentially limited economic cost. These futures do not address income inequalities and potentially increase food security concerns for the most vulnerable members of society. The authors conclude that developed region-led international cooperation and in-kind income transfers to developing countries constitute a necessary prerequisite to help remedy the SDG trade-offs exhibited within the more sustainable global pathways. The well-meaning conclusions of the authors need not materialize, especially in view of developing political trends.

Can this type of scientific research impact the public in its pure form or does it need to be abridged for the lay person? Many surveys indicate that there is growing global concern and awareness regarding climate change and that people expect political action from their governments (Corner, Demski, Steentjes & Pidgeon, 2020). In order to reduce carbon emissions, people will need to change their behaviour, work practices and levels of consumption. Growing concerns about climate change may affect mental health and cause anxieties. Effective climate change communication will require greater engagement of the social sciences which must close the gap between hard science and enlightened citizen action (Howarth, Parsons & Thew, 2020). Social sciences take us back to universities.

Can universities help the public and politicians make informed decisions about our common future? Universities are institutions that can provide not only sound scientific data on the environment, but also possible solutions for reversing the effects of environmental and climate change. Universities can also analyse and convey the impact of non-sustainable and sustainable technologies on the economy and society.

One of the missions of universities has been well defined by P. Benneworth *et al.*, (2019) who stated that there was a "myriad of ways in which universities

contributed to changing the world by equipping civic society with new ideas, challenging injustice and reflecting on past failures, by creating platforms for silenced voices and supporting the development of better policies and better democracy". Universities also play an indirect systemic capacity-building role, for instance by providing informed and unbiased analysis and information, thus contributing to the development of institutional and social capacities. This second role of universities can be characterized as developmental, going beyond the direct influence on economic growth (Gunasekara, 2006). Universities can also promote societal development through their core mission of teaching. By preparing their students to become informed and responsible members of society and by educating the thought leaders of tomorrow, universities are able to develop considerable transformative potential (Hengartner & Däppen, 2020).

Many universities have already or are currently incorporating the SDGs into their institutional strategies and curricula. Numerous documents have been published that provide relevant points and inspiration how to communicate science for climate change solutions in both the developed and developing world (Howarth, Parsons & Thew, 2020), (Corner, Shaw & Clarke, 2018), (Dupar *et al*,, 2019).

Any successful communication, including communication on climate change, depends on understanding which views attract people and which do not. Public support may be expected only if the science is clearly conveyed. Natural and social scientists need to collaborate to align their messages to the public they want to activate (Howarth, Parsons & Thew, 2020). The involvement of social sciences in interpreting the consequences of climate change on society is essential. Thus a communication strategy needs to be carefully defined and the communication of climate change given many voices, adapted for different groups of citizens. Even though there is widespread support for climate action, there seems to be no relevant behavioral change. Scientists, practitioners and politicians have not succeeded to communicate climate change in a way that resonates with and empowers a wider audience.

Article 6 of the UN Framework Convention on Climate Change lists actions that engage and empower citizens at all levels to combat the climate crisis: education, training, public awareness, public participation, public access to information and international cooperation. All these actions require good communication skills.

Effective communication may be achieved with good narratives. Narratives that define climate change in a way that touches upon local and personal circumstances are especially successful. They can inspire action on climate change by means of stories presenting complex issues. Narratives can also help overcome barriers to change, once they have been identified. Quality communication on climate change can promote actions, as well as hope and

opportunities. It must be constructive and solution-oriented by sharing positive real world examples (Howarth, Parsons & Thew, 2020).

CONCLUSION

If universities are truly going to embrace the SDGs and impact society, the mission is clear. Multi-, trans- and interdisciplinary research are providing the much-needed synergy, but academia still does not function holistically. A more holistic approach to academic development would consider the whole of the academic role, the whole institution and the whole person without losing focus and coherence. A step in the right direction could be to encourage the various research fields and the practitioners providing the professional development to speak to each other more (Sutherland, 2018). Such a development might bridge the all too common communication gap between natural and social sciences. Once resolved, there could be endless opportunities, one of them being effective communication on many scientific issues including climate change.

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FIGURE CAPTIONS

Figure 1. Exxon's private prediction of the future growth of carbon dioxide levels (left axis) and global temperature relative to 1982 (right axis). Illustration: 1982 Exxon internal briefing document (Franta, 2018)

Figure 2. Five year trend in proportion of Americans that are worried about global warming (Gustafson, Bergquist, Leiserowitz & Maibach, 2019)

Figure 3. Assumed global trends in emissions and fossil energy usage (Philippidis, Shutes, M'Barek, Ronzon, Tabeau & van Meijl, 2020)

PART II

How Citizens Participate in Research

CHAPTER 5

The University of Washington Population Health Initiative: an Integrative Approach

Ana Mari Cauce, Derek Fulwiler & Ali Mokdad

INTRODUCTION

The work we do matters — well beyond the borders of our campuses. Large public research universities are key to both the cultural and economic vitality of the cities and regions in which they are located. For example, the University of Washington's Seattle campus is home to a world-class art museum, the state's natural history museum and a nationally acclaimed performance centre for music and dance. The fact that they are part of a university leads them to provide special educational opportunities that shape the next generation. Dance ensembles that perform at our Meany Center for the Performing Arts put on special free performances for school-children. The Burke Museum of Natural History and Culture provides special programmes in partnership with local schools and operates a "Burkemobile" that brings artifacts from its collections to more remote areas of our state, offering hands-on experiences to youth who cannot easily get that experience elsewhere. Boardwalk trails through the wetland restoration project at UW's Bothell campus and UW Tacoma's prize-winning work on historic preservation and public art in the heart of downtown Tacoma also illustrate how universities add richness to their local communities.

The University of Washington is also an economic engine for the state. A recent study found that across its three campuses, UW generated a total

impact on the state's economy of more than $15.7 billion (Parker Philips Inc., 2019). The study further concludes that the economic activity of the UW's campuses supported or sustained 100,520 jobs throughout the state. In addition, our faculty, staff and students routinely partner with legislators or local community leaders to help develop or assess the impact of policies or programmes. As part of a livable cities project, we partnered with a mid-sized city north of Seattle to provide research, analysis and recommendations regarding level of service methodologies for the city to consider when updating its Parks, Arts, Recreation and Conservation comprehensive plan. We have also been a very active consultant with state leaders on wetland preservation, waterway clean-up, health care policy, transportation infrastructure, clean energy and so much more.

Our vision statement is not a lengthy pronouncement ensconced in a glossy brochure; it is short, simple, and ambitious — through our educational, research, healthcare and service missions, we aim to be the top public university in the United States in terms of impact upon our community and across the globe. It is this vision that led to the launch of the University of Washington Population Health Initiative, which provides us with an unprecedented opportunity to help people live longer, healthier, more productive lives. In this chapter, we will present our vision for population health, describe the governance structure for this interdisciplinary initiative, its key accomplishments to date, and lessons learned that will inform our future work. Our experience to date might also be helpful to others taking on interdisciplinary initiatives focused on making a significant impact on communities near and far, both in the immediate and distant future.

We fully understand that as more and more colleges and universities seek to have an impact on their communities and the world at large, some fear that we might be abrogating the central role we have played in basic or curiosity-based research. There is no question that our society would be impoverished if this were the case. In today's world, universities and affiliated research centres are the primary, if not sole, place where basic research is carried out. Basic research provides the foundation and underpinnings for the more applied outcome-focused and goal specific research that endeavours like the Population Health Initiative seek to carry out. For example, it would not have been possible for the scientific community to have so quickly developed the vaccines against the coronavirus, or Covid-19, were it not for the decades-long investment that federal agencies such as the National Science Foundation and National Institutes of Health made in basic research in areas such as genome sequencing and mRNA as a potential platform for vaccines (Kinsella *et al.*, 2020; Frank, Dach & Lurie, 2021).

Despite the many urgent and pressing problems that confront our world today and to which we can, and must, direct our research, it would be a

critical mistake to not support high quality basic research, even if it is not clear whether that research will ever be useful other than to satisfy our curiosity about how the world works. History has shown us time and time again that while the path to get there may take us down blind alleys and through unexpected turns, unfettered human curiosity will lead us to discoveries that matter, often as much by accident or serendipity as by design.

We may not be able to create a precise plan or detailed roadmap for how to turn all our basic research into more specific applications, but we know that this often happens when disciplinary boundaries are crossed. It is no coincidence that our world's most creative and influential cities lie at the crossroads of migratory pathways where different cultures are brought together. Consciously creating settings that encourage, or even require, interactions that break down disciplinary silos can ignite the spark that turns the blind alleys and dead ends of a single discipline into new interdisciplinary pathways that, in essence, give serendipity a push.

Another key aspect to having a positive impact upon society — to turning our knowledge into products, whether vaccines, new technologies or new policies to address homelessness or immigration, is more fully understanding the communities that will be most affected. This requires that we take the time to seek out and listen, really listen, to the myriad voices at the margins of society as well as to those at the centre.

All three campuses of the University of Washington, as well as our joint medical school partnership with Gonzaga University in Spokane, have the good fortune of being located in cities and regions characterized by growth and opportunity, serving as homes to forward-looking businesses and non-profits that have shaped and are shaping the future. It is vitally important to cultivate and engage in meaningful ways with those business communities, as well as civic leaders, union leaders and others who wield power and influence. Collaborations with such entities and their leaders is critical to developing partnerships that can create change. Our ability to graduate well-prepared students is key to the growth of these entities and the fact that they offer good jobs for our students, as well as to the spouses and partners of our faculty and staff, makes us a more attractive place to study and work. It is a win-win. But not everyone has shared in the victory, and these inequities have only been magnified in this year of pandemic.

We have all suffered and faced hardships throughout the Covid crisis. Businesses large and small have been forced into bankruptcy, and entire industries, especially those related to travel or tourism, have been severely challenged. In Seattle and throughout our region, our normally thriving urban centres have seen increases in violence and are facing a homelessness crisis that affects us all. But there is no doubt that some have had it easier than others, working remotely from spacious homes or apartments with high speed

Internet, having goods delivered to them and able to provide their children with tutoring to supplement online classes. Many of those who were already well off have flourished financially, with assets and investments that have grown in value.

However, just miles away from posh, urban high-rise apartments and condominiums or suburban homes in tree-lined neighbourhoods are people who, not for lack of talent or hard work, but by accident of birth, have not had these same opportunities. These are people whom you will not find at town halls, who do not write letters to newspaper editors or sign petitions. In some cases, they do not, or cannot vote. They too have dreams for themselves and hopes for their children. They go off to work each day and form the core of those the pandemic has dubbed "essential workers". Yet they are not always sure of how much they will earn or whether they will earn enough to support their families. Many women go back to work just days after giving birth, even those who are raising children alone — having lost partners to violence or drugs, disease or incarceration — or perhaps because they fled violence from a war or a natural disaster impelled by climate change.

Many face discrimination because of their race or ethnicity. It presents itself in big and small ways, from whether they can find a decent place to live, to whether the local security services stop, question and harass them on the street or worse. Parents send their children off to school each day, hoping more opportunities will be possible through education. But many of them leave their homes without having breakfast. And when they do have food, it is often lacking in the nutrients needed to power their growing bodies and minds. In this community, good food is expensive and scarce.

Children often go to underfunded and declining schools. Dedicated teachers do their best with what resources they have. They do everything they can, as do their colleagues who work in nearby clinics — working with those who come to them with conditions that were preventable and diseases that were treatable — if they had been covered by insurance, or if the treatment were affordable, or if they were able to afford missing work to get care. Their daily trials are largely invisible to the world, but in order to have the impact that we desire, they must not be invisible to us as we educate, innovate and inform. We talk a lot about innovation and disruption, but less about those whose lives the innovation has disrupted, who have seen the living spaces they grew up in become unaffordable through gentrification, and for whom inequities and disparities in opportunities can translate to a difference of a decade in life expectancy (Cauce, 2016).

As a public research university, supported in part by taxpayer dollars, we have a duty to contribute to the betterment of our entire community, including those who are so often unseen, unheard and treated as if they are unwanted. We must be not just the University of Washington, but also the

University *for* Washington. Universities can and should serve as settings that facilitate and lead public discourse about the best ways to solve the most complicated and seemingly intractable challenges of our time. Whether pandemics, climate change or healthcare inequities, these challenges will require us to work across disciplines within our own institution *and* to authentically engage and work across all the communities and stakeholders that we serve. The diverse viewpoints and perspectives they can bring to the table are critical for the deep and rigorous analysis we engage in as scholars and practitioners. At a time when policy debates are too often based on unsubstantiated assumptions or are purely ideological and fact-free, universities as a fifth force are called upon to present our work to policy-makers and to the public so that they can make informed decisions.

The University of Washington is the leading public university in the United States for sponsored research with world-class programmes in every one of our schools and colleges. We are home to some of the largest, most comprehensive biomedical, environmental and international studies programmes in the world, as well as one of the leading health care systems that includes our nation's top medical school for primary care. Our Population Health Initiative, a key vehicle for fulfilling our public mission, was developed taking into account these strengths, as well as the strengths in our community. Among our many assets in the Seattle and the Puget Sound region is the Bill & Melinda Gates Foundation, the world's largest foundation, which is dedicated to fighting poverty, disease and inequity. We are also home to more than 250 other organizations, large and small, working on population and global health. The Paul G. Allen Foundation, working to preserve ocean health, combat climate change and strengthen communities, and Bezos Family Foundation, which focuses on strengthening the power of learning, especially in early childhood and adolescence, also work on issues integral to our broad population heath mission. Indeed, there are few places on earth with more opportunities for collaboration and collective impact, a key motivating factor for choosing populations' health as an area of focus for our university.

The Seattle-Tacoma-Bellevue region is also consistently rated as one our country's strongest metropolitan areas for its economic strength, on the cutting edge of cloud computing, artificial intelligence and data software and technology. A key goal of this initiative is to integrate the work taking place within the university and between UW programmes and those in the local community and beyond. By strengthening the partnerships that already exist and building new ones, we can accelerate the speed at which impact and progress are realized.

We are firmly planted in a beautiful land of glaciers and volcanos, deserts and marshlands, first settled by the Coast Salish people. Our core mission is

to improve the lives of the people of our state. But, like the giant trees in our rainforest, whose roots spread out for hundreds of feet and intertwine with the roots of others, further multiplying their reach, our university's reach does not end at our state borders. Our aspiration is nothing less than to change the world. We are both citizens of our state and citizens of the world, a state and a global university. We have the ability and the *responsibility* to act on behalf of the local and global good, because if we have learned anything this year, it is that they are intertwined and inseparable.

DEFINING POPULATION HEALTH

The University of Washington's Population Health Initiative is based on a broad conception of health, encompassing not only the elimination of diseases and injuries, but also the intersecting and overlapping factors that influence how long and how well we live. These influencing factors include a range of issues that affect the lives of billions of people around our country and the world, including, but not limited to, climate change, education quality and affordability, poverty, access to and quality of health care, systemic inequities and racism, governance structures and policy, urban planning and more. We nested these factors within three major pillars — human health, environmental resilience and social and economic equity — which provide a framework for our efforts.

CREATING A GOVERNANCE STRUCTURE

To reflect the whole-of-university interdisciplinary approach necessary to realize our vision, we were intentional in housing it within the Executive Office of the President & Provost. Professor Ali Mokdad, the chief strategy officer for the initiative, responsible for facilitating and directing its vision, strategy, and implementation in an inclusive and collaborative way, reports directly to the President. It is governed internally by a 30-member Executive Council that the President chairs and is responsible for developing, implementing and measuring progress towards realizing the initiative's vision, goals, objectives and implementation strategies. A critical component of the Council's work is helping to break down internal silos so that we can take a more comprehensive, interdisciplinary approach to population health based on our university's strengths, our geography and our local and global partners.

The Executive Council is a mix of faculty, undergraduate and graduate students, and staff from a range of different disciplines. Each has a mandate to be a conduit to those groups who are not on the council. The Council refreshes on an annual basis with a regular rotation schedule, thereby ensuring new voices and disciplines are routinely integrated into the Council discussions.

We also believed it was important to have an External Advisory Board to, in essence, "hold our feet to the fire" and ensure that the initiative stays true to its values and continues to grow and move in the right direction towards realizing our vision. Chaired by Bill Neukom, who is known for his decades-long leadership of Microsoft's law and corporate affairs team and Founder/CEO of the World Justice Project, it is made up of leaders from across the nation and the world. Members of the board offer advice and advocacy in areas such as strategic planning and programme development, furthering our understanding of global population health trends and ensuring that our work remains relevant to pressing and urgent needs.

DEVELOPING VISION AND MISSION STATEMENTS

The Executive Council spearheaded the development of the vision and mission for the initiative's work that will play out over the next two decades. They are simple, direct and easy to comprehend, but based on a quarter-long visioning process in 2016 that engaged more than 600 faculty, students and staff at the UW through focus groups and surveys.

- **Our Vision** — The Population Health Initiative creates a world where all people can live healthier and more fulfilling lives.
- **Our Mission** — The Population Health Initiative addresses the most persistent and emerging challenges in human health, environmental resilience, and social and economic equity. Through partnerships with local, national and global communities, we develop, implement and disseminate transformative knowledge through our research, service and teaching.

KEY ACTIVITIES AND ACCOMPLISHMENTS TO DATE

The broad and ambitious vision and mission of UW's Population Health Initiative requires contributions from every one of the university's schools and colleges in partnership with external collaborators. Specific, initiative-led activities intended to accelerate measurable, positive improvements include:

- **Catalysing innovative, interdisciplinary research** by funding pilot projects that require collaboration by researchers from different disciplines, offering bridge funding for units proposing relevant joint faculty hires across different schools and colleges, supporting development of grant submissions via writing and budgeting resources, and leading interdisciplinary projects in a wide range of areas ranging from improving vaccination coverage to bolstering community well-being.

- **Advancing population health education and training** by ensuring our graduates leave the UW with an understanding of the range of factors that impact our health and well-being, including how their specific discipline contributes to improving population health. This work occurs through a mix of courses, fellowship programmes and a certificate programme that are now collectively engaging 3,000 to 4,000 undergraduate and graduate students per year.
- **Spurring new partnerships** by acting as a front porch to the university for external collaborators who seek to work with the UW to improve population health. Through the initiative, local, national and international academic institutions, foundations, nongovernmental organizations, government agencies, corporations and others are able to easily and seamlessly explore and engage the full breadth of population health–related expertise at the UW.
- **Sparking new collaborations** through programming and creative uses of the convening spaces in our new 290,000 square foot Hans Rosling Center for Population Health, which will act as the university's hub for bringing students, researchers and partners together from across disciplines and sectors to take on the challenges we face to our health and well-being. This building was made possible by a transformational US$210 million gift from the Bill & Melinda Gates Foundation in 2016, as well as $20 million in funding from the people of Washington State.

Some examples of the population health-focused projects being conducted at the UW include a study of the links between environmental factors and health outcomes by researchers in the Department of Environmental and Occupational Health Sciences, which measures the impact of air traffic pollution from Sea-Tac International Airport on surrounding neighborhoods. Another is Moving to Health, a collaborative study between the UW's Center for Public Health Nutrition and Kaiser Permanente's Washington Health Research Institute that examines how different neighborhoods influence a person's health. Another collaboration between faculty in the School of Law and the Foster School of Business that focuses on helping minority-owned small businesses thrive during the pandemic using a three-stage process which includes creating a Covid-19 resource list for small businesses, providing a series of negotiation trainings and offering one-on-one pro bono legal consultations. And the Mama Amaan (Safe Motherhood) Project is a pilot programme between the Somali Health Board and the UW that seeks to provide culturally appropriate pre- and post-natal support for mothers in East Africa immigrant and refugee communities in King County, illustrating the link between the local and global.

Since the launch of the initiative five years ago, we have engaged nearly 10,000 students and approximately 1,000 faculty via our programmes, projects and other activities. And a range of UW schools and colleges have embedded population health concepts into courses and curriculum, while others have updated the names and missions of departments and degree tracks to be more population health-oriented. We have also seen a broader embrace of interdisciplinary collaboration across our university, including a faculty-led push for increased recognition of interdisciplinary research in promotion and tenure considerations.

On the research front, we have supported the launch of nearly 100 innovative, interdisciplinary projects like the ones just described, through pilot grant funding and proposal development support. Findings from these projects have been published in a variety of peer-reviewed journals and have informed the public via media coverage. The projects have also advanced the educational and training experiences of a number of UW graduate students. In addition, these projects have leveraged their findings to secure new funding from federal sponsors such as the Centers for Disease Control and Prevention, National Institutes of Health and National Science Foundation, as well as a range of foundations and international sponsors.

The initiative has opened doors to a number of new domestic and international partnerships with universities, foundations, non-governmental organizations, corporations and others to advance common goals in improving population health. These partnerships have yielded successes in the form of faculty, student and staff exchanges to build knowledge and capacity; pursuit and award of jointly funded research projects; technical advising on topics ranging from climate change to health disparities; and more.

Finally, the construction of our new Hans Rosling Center for Population Health was completed on time and under budget, despite major portions of construction occurring during the pandemic. This new facility offers space for collaborative group work, active learning, offices and training for global partners and multidisciplinary work in population health across the university, acting as a hub that ushers in a new era of greater interdisciplinary collaboration to address critical issues like poverty, equity, climate change and health care access.

PIVOTING TO THE COVID-19 PANDEMIC

Our region and our university have been on the frontlines of the response to the novel coronavirus (Covid-19) since the first confirmed case in the United States was identified in Snohomish County, Washington, on 19 January 2020 (Holshue *et al.*, 2020). The Seattle Flu Study, based at our Brotman Baty Institute for Precision Medicine, identified what was at that time the first

documented U.S. case of community transmission on 24 February 2020 (Chu *et al.*, 2020). The Virology Lab in our Department of Laboratory Medicine had already been preparing for high-volume Covid-19 testing and quickly began accepting specimens following a Food and Drug Administration policy change in early March (Hamilton, 2020).

On 6 March 2020, we became the first major university in the U.S. to announce all classes would be conducted remotely (Cauce, 2020). At the same time, our Institute for Health Metrics and Evaluation began developing one of the first Covid-19 models (IHME, 2021), a model that remains one of the most widely cited around the world. And, since then, UW-led research on Covid-related topics ranging from social isolation to online misinformation, educational consequences of Covid to health disparities in who gets it, have played prominently in the national and international response to the pandemic.

Our Population Health Initiative played a key role in the pivot to Covid-19 research, moving quickly to support the launch of a range of novel projects by UW researchers. In April 2020, the initiative issued an initial funding call for a round of Covid-19 pilot grants focused on rapid response projects. A second round followed that focused on projects seeking to better understand, mitigate or reverse the economic impact of Covid-19. A third and final round of grants focused on population health equity, supporting UW researchers in partnering with communities of colour — which have been disproportionately impacted by the pandemic — to co-develop research projects that addressed community-identified needs.

All told, the Population Health Initiative awarded 53 Covid-19 pilot grants, with the overall impact of these projects serving to:

- **Inform scientific response** with the publication of project findings in journals such as Science of The Total Environment, International Journal of Environmental Research and Public Health and American Journal of Obstetrics & Gynecology. Topics addressed include community-level factors associated with cases and testing equity, wastewater testing methods and risk of infection and death during pregnancy,
- **Inform response across sectors**, with project findings supporting the pandemic response of entities including Casa Latina, Northwest Harvest, Public Health — Seattle & King County, SeaMar Community Health Centers, Washington State Department of Health and more.
- **Inform individual response** through media coverage of the results and impact of many of these projects via local and national television and radio broadcast, as well as local and national online and print media, thereby helping individuals understand how to best assess risk, take appropriate protections and so forth.
- **Secure additional funding** to scale or expand the work, with researchers receiving follow-on funding from government sponsors such as

the Centers for Disease Control and Prevention, National Institutes of Health and National Science Foundation, and from foundation sponsors such as the Ballmer Group and Paul G. Allen Family Foundation.

LESSONS LEARNED

In light of limited finances, the incredible breadth of the initiative's mandate and the lofty ambitions of our faculty and students, it was critical for us to work closely with a range of stakeholders to determine the most integrated and cost-effective path forward that would lead to the largest impact. Over the last five years, we have learned a number of lessons about how research universities can leverage their intellectual and financial resources to do this. These include:

- **Take an "all-of-the-above" approach to creating a big tent** to illustrate to different disciplines — particularly those who have not traditionally viewed themselves through a "health" lens — that they belong and have as much to contribute as the health science disciplines. For us, this included creating an internal governance board (i.e., Executive Council) that regularly rotates to ensure new disciplines and perspectives are routinely being heard. We also devote a substantial amount of time to in-person and virtual engagement with a wide range of our students, faculty and staff.
- **Engaging an external perspective is critical** to keeping you grounded in this type of an endeavour. We regularly think about the work of the initiative within the university, which at times can cause us to lose sight of the proverbial forest for the trees. Our external advisory board plays a key role in keeping us focused on key matters of strategy to ensure we continue moving closer to realizing our vision.
- **Take the time to develop a common language**. A significant portion of our first six months of work was dedicated to developing a common language as we found that different disciplines would speak about the same topic in surprisingly different ways, which could lead to confusion or unnecessary creative friction as we were going through visioning exercises to plan the work of the initiative.
- **Having core central staffing is essential** to operationalize the vision and manage the day-to-day functions of the initiative. These types of resources both accelerate the speed of progress and lift unnecessary administrative burden from university leadership.
- **If resources are limited, channel them in ways that incentivize interdisciplinary collaboration**. One of our most highly successful

collaboration mechanisms has been the pilot grant programme that requires partnerships with other disciplines in order to submit applications. This mechanism has created some powerful new partnerships and truly innovative ideas that otherwise would have not come to fruition.

- **Yet also recognize that not all impactful activities will require significant funding.** We have successfully developed a number of low-touch, low-cost activities that have particularly resonated with faculty. These include the ability to request letters of support for grant applications, as well as offering structured networking sessions organized around thematic areas to make it easier for UW researchers to meet new collaborators.

CONCLUSION

We launched the University of Washington Population Health Initiative five years ago with the goal of bringing our university together with external partners in a more interdisciplinary and collaborative way to speed progress toward improving the health and well-being for those living locally and around the globe. While this vision is audacious, our work proceeds in the knowledge that it is the health of communities — and the people in them — that ultimately matters.

We have taken a deliberative, integrative approach to developing the infrastructure needed for this whole-of-university approach to improving population health. We have developed a variety of mechanisms to catalyse innovative, interdisciplinary research, advance population health education and training, spur new partnerships and spark new collaborations. Along the way, we have learned a number of key lessons about what works best, a list that will undoubtedly grow as we move further down the road of this decades-long journey.

Above all, our progress has been marked by the eager engagement and involvement of people who seek to add their voices, talents and inspiration to this shared vision. We believe that integrated, cross-disciplinary efforts developed, informed and influenced by diverse community stakeholders, offer a promising avenue for research universities to make a positive difference both directly through the community and global impact of the work itself, and by shaping the understandings, aspirations and skills of their students, who will become our future leaders. We welcome and encourage you to reach out with your ideas and enthusiasm because only through collaboration and cross-pollination can we collectively create a world where all people live healthier and more fulfilling lives. Together we are stronger.

Please visit www.uw.edu/population health to learn more about the initiative and stay abreast of its progress.

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CHAPTER 6

Rule by the People, the People of Knowledge: how Science Communication Strengthens Democracy

Kerstin Krieglstein & Rimma Gerenstein

The Covid year 2020 generated many unexpected headlines. One that caused quite a stir in Germany was featured in the *Bild* tabloid newspaper, which has a wide circulation. This headline in May translates as: "Questionable Methods: The Drosten Study About Infectious Children Is Grossly Incorrect" (Piatov, 2020). Within just a few hours, a media storm had stirred that kept the issue alive for a long time. So what happened? The paper accused Christian Drosten, a virologist from Berlin who has become probably the most prominent and renowned science explainer in the country, of not following the correct procedures and making false statements about the risk of infection from children transmitting the virus. Furthermore, the article claimed that his study was the reason that policy-makers spoke out in favour of closing all schools and daycare centres in Germany. The paper asked: "Have German school policies fallen victim to a faulty study?" (Piatov, 2020). Several of Drosten's peers were also quoted in the article as criticizing the study, questioning the results and even calling them wrong. There were quick reactions across all social media channels and the tone was often insulting, aggressive and aimed to delegitimize researchers and politicians in general. One user on Twitter wrote, "Perhaps, dear Mr … Drosten, *Bild* is right again — and you — you, who have been feeding us fear and panic for months and taking us for fools in the name of the government, are wrong."

The "Drosten Case" represents a culmination of several aspects. On the one hand, part of the population freely voiced their growing scepticism toward scientific findings on social media. Frustration with the pandemic situation became mixed with criticism of policy-makers who seemed to be basing their decisions on dubious research results. On the other hand, countless media, including leading newspapers in Germany, focused on the ethical standards of journalism and explained that the study in question was available only on a preprint server because it had not yet passed peer review and been officially published. What is more: The critical statements of Drosten's peers were taken from their comments on the study, which had been written as part of the peer review process and were not meant to be cited as final conclusions, but rather as suggested corrections and pointers.

This case deserves closer inspection, perhaps through a thought experiment. Would a tabloid paper have published such an article if a large part of the population knew more about how things work in science? Would there have been such outrage if society were more knowledgeable about how the publishing of scientific findings works? Would the credibility of researchers have suffered as much if people understood that it is a sign of quality assurance when colleagues give critical pointers to authors of studies, so that they can review their methods and findings before publishing them? Would it have been possible to accuse researchers and politicians of corrupt dealings if citizens knew more about the basis on which policy-makers make decisions, and what role research plays in this? These questions may be hypothetical, but they are right on the mark in the current conversation about the importance of science and science communication, and the demands they must meet.

SCIENCE AND POLITICS: SHARED CHARACTERISTICS

The Covid-19 pandemic has been a particularly clear example of the significance of science. Scientific findings have led to the development of vaccines and served policy-makers as a basis for the measures taken to contain the virus. Science and science communication are thus strong partners for policy-makers in the fight against the coronavirus crisis and its devastating impact on social, cultural and economic life. We have seen how science communication across a variety of media — public broadcasting stations, leading newspapers in Germany, social media and many communication channels of universities — has contributed to conversations in society by providing a factual basis, assuaging real fears with clear arguments and making an increasingly complex, multifaceted and nerve-wracking world more understandable. However, we have also observed how the many political, economic and social crises of the 21st century and the new ways that people communicate due to social media have resulted in a situation in

which science and politics have become the target of assaults. The number of attacks meant to delegitimize them is on the rise, and opinions have been voiced publically that aim to discredit politicians and researchers as "elites who are out of touch with reality" while trying to legitimize "alternative facts".

In a democracy, politics and science share several decisive characteristics: Both fields do not act alone, but seek alliances instead. Both also do not declare simplified, ultimate truths; rather, the precision and current relevance of their statements are grounded in empirical data and facts. They are also both accountable to society to a high degree in that they must communicate their decisions and findings in a way that is transparent and understandable to the public. Should they fail to do so, they stand to lose the valuable trust citizens have placed in them. These similarities between the two fields suggest the hypothesis that science communication can strengthen the foundations of a democratic society. Especially in today's world, which is increasingly based on knowledge, science communication offers sources of reliable information. For example, one form of science communication — citizen science — gets people involved in research projects and makes it possible for a wide variety of target groups to access knowledge and experience democracy in its most original form — namely, through representation and participation. Science communication also increases our appreciation for those political decisions that are based on scientific facts and that take needs of society and social changes into account.

WHAT IS THE ATTITUDE TOWARDS SCIENCE IN GERMANY?

Science communication has an enormous potential that extends beyond the current crisis. The science barometer, which is a representative survey of the German population conducted by the *Wissenschaft im Dialog* (Science in Dialogue) initiative, from the end of 2020 showed that roughly 60% of all respondents were somewhat or very strongly interested in scientific issues. This figure has changed very little compared to previous years (Wissenschaft im Dialog, 2020, p. 6). Of those surveyed, 60 percent also said that they trust science and research somewhat or completely. Another 30 percent were undecided, and only seven percent said that they distrust science and research either completely or somewhat. (Wissenschaft im Dialog, 2020, p. 10). On the other hand, one third of the respondents also said that scientists do not make enough effort to inform the public about their work, while another third was undecided. These results, which coincided with the surveys from previous years, are remarkable because they show that the majority of the population is interested in science and trusts it, but also that two thirds are not satisfied or are undecided about how science is communicated.

That there is room for improvement has also come to the attention of policy-makers and in the last few years science communication has become a buzzword of the federal government. The German Federal Ministry of Education and Research also published a cross-party policy paper on this issue (Bundesministerium für Bildung und Forschung, 2019) in which it encourages scientists to communicate and convey their research findings in a way that is understandable to the general public — meaning they should engage target groups outside the science world in a conversation. The top research institutions in the country agree with this policy, and several working groups are now discussing possible formats and structures of science communication. Within this development, "open science" is becoming an increasingly important factor in higher education policies. This term combines a series of strategies and measures for making scientific content — such as research results, databases, and scientific software — available to the broadest possible public at no cost and with no legal hurdles. This means that those wanting to shape research policies today must create structures that not only make science transparent and open, but also make research processes more collaborative, and enable the transfer of research to society.

ACKNOWLEDGING SOCIAL RESPONSIBILITY

This cultural change is inevitable. A modern, open and science-based society cannot afford to have ivory towers. It is not enough even for Nobel Prize winners to simply refer to their list of publications on climate change or the prevention of widespread diseases. In a time when society is searching for advice and guidance, and for context and evaluation, research cannot turn its back. Providing answers to questions in language that can be commonly understood must be part of the professional ethics of researchers. This is where universities come into play. They are the custodians of science and research, and they are where the brightest minds are at work. The work done at universities is also paid for to a large extent through public funding. Within a democracy, these institutions enjoy unrestricted freedom of expression and research, meaning they are ideally suited to put their work in the service of democracy.

Over the centuries, fundamental conditions for universities have continually changed in terms of organization, financial situation, working methods, self-image and their relationship with society, business and politics. What universities are expected to do for society and how their responsibility to society can be strengthened and guaranteed is still a topic of discussion today. A study by the Körber Foundation titled "The Place of Universities in Society" (Maassen *et al.*, 2019) clearly shows that universities must meet a broad spectrum of demands and expectations, including making a more direct and efficient contribution to economic growth, social inclusion and

cultural diversity. In short, universities are expected to make their expertise available for the benefit of society, regardless of the issue. This knowledge transfer can take a variety of forms and formats: through the registration of patents, collaboration with partners in industry, granting the right to use certain research results, advising political and economic institutions, offering continuing education and providing science communication. Furthermore, this transfer can and should be a natural part of research and teaching at universities (Maassen *et al.*, 2020, p. 9). This is an enormous responsibility and a long-term development. The authors of the study also reached the conclusion that, when it comes to the legal and financial conditions and the administration and institutionalization of these tasks, universities still have a long way to go.

As the rector of a major German comprehensive university, I can only agree with their assessment. For several years now, universities have had to operate with far too little basic funding, with the result that it is very difficult to keep up with new developments and demands. At the same time, I believe that universities have the best potential to be innovative, reliable and powerful allies for society and policy-makers when tackling shared challenges. It should therefore come as no surprise that the Stifterverband für die Deutsche Wissenschaft, an association of donors who support humanities and sciences in Germany, published a policy paper in June 2020 (Krume *et al.*, 2020) in which they wrote that knowledge transfer is on the rise and that universities have proven themselves to be creative, resilient, adaptable and open in their communication regarding Covid-19. Researchers have networked across the borders of countries and academic fields in the pandemic to share their research results in their collective search for solutions. Virtually overnight, universities created new forms of communication, including online discussions and podcasts that specifically target the general public. They have also significantly contributed to the development of new forms of online continuing education, networking platforms and business models. Last but not least, they provided practical help — for example, by producing personal protective equipment — and have used their expertise to collaborate with city councils and companies (Krume, *et al.*, 2020, p. 5).

SHARING RESPONSIBILITY

The growing and diverse demands made on universities as sites of knowledge — knowledge that they strive to transmit and transfer — suggest that higher education institutions need strong allies to be able to successfully operate at the interface of science and the public. By the same token, policy-makers and representatives of civil society rely on science as an effective partner. If we look at the challenges and developments in the world today, such as

climate change, species extinction, artificial intelligence, global migration and inequality, it becomes clear that research on today's urgent issues will have a huge impact on our future.

Politicians in Germany recognize the importance of science communication and have made it a top priority, which is a boon to universities. The University of Freiburg has also established the new Business unit Science Communications and Strategy as part of its university administration. In light of these developments, researchers are now also obliged to take time from their already busy schedules of researching, applying for grants, teaching and administration responsibilities to focus on communication. The key question is therefore: How can policy-makers make science communication more worthwhile for researchers? The time, energy and creativity they invest in producing the understandable, conversation-inspiring communication of research results should ultimately pay off, meaning that policy-makers need to make more resources available to researchers and universities. One idea would be to relieve those researchers who put a strong focus on science communication from some of their administrative duties, which would require more personnel who could assume these responsibilities. Another idea I believe would be important would be to factor in the cost of science communication in the budget from the get-go when writing grant applications for projects that aim to transfer knowledge to society. And then there is the political consultation that researchers provide. Policy-makers are right to refer to scientific research to justify and legitimize their decisions. This is one of the main qualities of a democracy built on sound, evidence-based knowledge. However, the public is usually not privy to the mechanics of political consulting, meaning that if this were made more transparent, it would boost the public's trust in the relationship between research and politics. According to an article in *Die Zeit* newspaper about improving the mutual understanding between science and the public by the journalists Maximilian Probst, Ulrich Schnabel, Anna-Lena Scholz and Martin Spiewak, "a common basis for a democratic conversation can only be achieved if politicians are open about what facts they are basing their decisions on." (Probst *et al.* , 2021). The four journalists convincingly argue that transparency needs to be integral to the structure of every government administration. One step in this direction would be to establish the post of chief science officer in the cabinet, who would then act as a liaison "between policy-makers, research institutions, and citizens" (Probst *et al.*, 2021). By the same token, I would also argue that education institutions — for example, secondary schools, civic education schools and schools of adult education — also need to communicate how the science process works.

The media are another strong partner for science and are the fourth estate of our democracy. Some may wonder why science and media should work as allies — after all, one of the most important responsibilities of the free press

is to examine the facts critically and to investigate. Yet, it is exactly for this reason that the media are a productive and necessary "opponent" for science. This is also why science communication is different from science journalism. Science journalists not only apply research to people's lives, they can also keep a critical eye on science and carefully choose what information they want to publish or not. As gatekeepers, they fulfil the essential function of quality management, while striving to ensure that information that has not been fact-checked or is purposefully incorrect is not published in the first place. Institutions such as the Science Media Center in Germany also build bridges between research and journalism by acting as brokers for knowledgeable and reputable experts who are willing to share their expertise and are able to communicate about topics that are relevant to society. This is why we need well-trained science journalists who have access to the infrastructure necessary to conduct their research. However, because of the cuts in the science desks at newspapers in the last few years due to financial difficulties, universities and science communicators are now concerned that this lack of quality and careful attention to the facts in journalism will have a negative impact on higher education institutions as well. Limited resources also mean that journalists are no longer able to report comprehensively about researchers' processes and methods, although this could provide the public with the necessary insight into the production, reviewing, quality assurance and distribution of knowledge. This is why we need more news reports about long-term research projects, interim results, reasons for controversies in the scientific community, partnerships between science and industry, and the awarding of grants, because all of this information contributes to greater transparency and makes reporting about scientific projects an integral part of our lives.

IDEAS FOR SCIENCE COMMUNICATION

With this in mind, it is important to discuss how a university can fulfil its responsibility to society. What measures can be taken and what forms of science communication can be utilized to improve the public's trust in evidence-based findings, while familiarizing them with the processes involved in scientific work? How can researchers explain what they do to various target groups in an understandable way? And how can the expectations and ideas of these groups regarding what research is capable of being realistically put into context? In the following, I will discuss several ideas that shed light on various aspects of science communication, but which by no means are intended as a complete list of possible approaches.

BUILDING INFORMED TRUST

According to researchers focusing on public trust and education at the turn of the century, simply disseminating specialized knowledge is not enough to build up trust in science in this increasingly information-based and diverse society with around-the-clock access to a growing number of seemingly equally relevant media channels and offerings to choose from. Instead, scientific processes, methods and values also need to be explained if we want to achieve what experts such as Dr Rainer Bromme, Professor of Educational Psychology at the University of Muenster, call "informed trust." (Bromme, 2020). But what does informed trust mean when applied to science communication about the coronavirus pandemic, for example? Lay people may be able to understand more or less how a virus is structured and how it binds to a cell and reproduces, and with help they may also be able to understand the differences between the newly developed vaccinations, how they affect the body and how a rapid test works, but this would not be enough to build the "informed trust" that creates a solid, substantial basis for synergy between science and the public. To achieve this, researchers would have to inform the public about how they obtained their findings, what ethical guidelines were followed and who commissioned the study in the first place.

Essentially, to use a metaphor, whether or not you enjoy a meal at a restaurant is not based solely on how good it tastes, but also on what goes on in the kitchen, on being able to see how cooks prepare the food and to ask where ingredients are from or how the dish is prepared. Communicating meta-knowledge about science as a system itself poses a major challenge to scientists and communicators. It requires them to be willing to be more transparent and to take a more strategic approach to how they choose, prepare and present information. Bromme and his team have shown that there are three significant factors that determine whether a person will trust another person that can also be applied to science communication: The estimated expertise, the integrity and the good intentions of the researcher (Bromme, 2020, p. 13).

I argue that all of these aspects should be integral to all forms of science communication today. Researchers should not only state their credentials, they should ideally also have a long list of publications on their subject of interest as proof of their expertise. They should also make it clear that they maintain certain standards, such as the Guidelines for Safeguarding Good Scientific Practice of the German Research Foundation (Deutsche Forschungsgemeinschaft). Furthermore, they should diligently cite their sources, make their methods transparent and ensure that it is possible to verify their work. Scientific integrity is the most valuable commodity that we have. Being able to verify a hypothesis, study or monograph is what makes it a scientific truth — or possible to prove it as incorrect — in the first place.

Society needs to know what the path looks like from a research question to a published article in a scientific journal — that there are many stations, phases and revisions along the way, and that it is discussed and analysed by colleagues as part of the process. Finally, researchers need to be clear about where their funding comes from, who commissioned their research and what their intentions are. They should not use their work to steer political processes in a certain direction or to stoke debates in society. They should not use their findings to support unpremeditated action or a personal agenda and they should not manipulate their findings for their own financial benefit. Truly independent science is evident in nature and does not stand for emotions or economic gains.

LEARNING FROM THE PROS

There are many ways to provide good and effective science communication, be this through podcasts where researchers have the time they need to talk about current projects, or through Instagram or Twitter accounts, where research institutions can post understandable information with well-designed infographics or short entertaining videos. Science communication can also take the form of events where the audience has the opportunity to ask experts questions. Several studies have shown that audiences find the formats where researchers can talk to target groups directly especially trustworthy. They also particularly appreciate those experts who can talk about issues in a clear and understandable language, who address their current situation in life and can offer something valuable like good advice about better nutrition or about how to be more eco-friendly, or by providing background information that helps them to better understand a political development. And while it may seem like no public relations, marketing or extras are involved; just expertise, plain and simple, and while also it is true that there may be some experts who are informed and can communicate well who do not need a facilitator, it is essential that we take a closer look at what kind of support researchers need to do the preparing, delivering and managing that this communication involves.

For this reason, I argue that science experts and communications experts should work together to provide professional science communication. It is the universities' responsibility to train researchers in science communication — in other words, to familiarize them with various formats for interacting with the public and to help facilitate this conversation in a professional and informed way. There are many reasons why science communication should be part of undergraduate, graduate and post-graduate degree programmes, just like academic integrity is included in these programmes. Young researchers need to acquire these increasingly important skills, regardless of their field of study. Already established researchers also stand to profit from science

communication training, especially in light of the fact that social media is replacing the traditional speaker-recipient model. Researchers nowadays must also address a highly fragmented public, providing content that can cover a broad spectrum. I argue that researchers should acquire not only a fundamental knowledge of the principles of non-linear communication, the use of conversational formats and technical skills like using videos and photos taken with a smartphone; science communication training should also teach researchers about media literacy, data protection and copyright, strategies of crisis communication and ethical principles of science communication when interacting with the public. While achieving this level of professionalism may be sobering to some researchers who think science communication is about spontaneous, informal and humorous interaction, I believe this is necessary to prevent researchers from naively speaking out to the media in a way that could make them vulnerable to potential attacks. The better researchers are at using the tools of science communication, the better their chances to contribute serious, fact-based information and collectively stand up to populist platforms. Communications directors in university administrations could offer a variety of services to help researchers cater to the needs of different target groups, to follow the principles of good research PR and to align content with the strategic and communication goals of their institutions and departments. However, in order to provide this level of intensive and qualified assistance and consultation, we need sufficient human resources in university communications offices.

In conclusion, as I have clearly argued, science communication is not a cure-all. It can have a limited effect when used without training or a comprehensive strategic framework. However, if it is based on a multifaceted infrastructure, science communication can successfully contribute to strengthening our democratic values. This consolidated capacity may not be a guarantee, but it is still our best chance to fend off populist attacks, as I showed in the example of science and politics in the case of Christian Drosten. My initial questions could therefore be answered as such: The more insight and trust the people have in research and political decisions, the less likely they are to be misled by sensational headlines or rabble-rousing posts with false information.

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CHAPTER 7

Decolonising research methodologies to transform and rebuild trust in science

Mamokgethi Phakeng

INTRODUCTION

Low levels of trust in science and shifting attitudes about university education signal the need for new models for higher education and research. While the argument for diversity is not new, the realization of it in corporate and academic organizations has been slow. In some cases, traditional practices for developing new talent may discourage the aspirations and progress of diverse recruits (Clarke & Gribling, 2008). In other cases, institutional culture may appear to expect individuals from diverse backgrounds to assimilate rather than bring the types of change that are needed for sustainability (Bodinger-de Uriarte & Valgeirsson, 2015).

The experience of the University of Cape Town (UCT) suggests that to achieve true inclusivity and diversity, universities need to adopt a much bolder approach that goes beyond lip service or hiring practices that seek recruits based on demographics. It is not enough to recruit people who look different; instead, we must seek out and develop staff members who think and behave differently and create an environment where they can thrive in their fields of research, teaching and professional practice. This requires a significant mind shift and an ability to recognize that excellence can take many different forms, all of which need to be recognized and celebrated.

To prove its relevance in an increasingly sceptical world, scientific research needs to disrupt familiar models, based on Western assumptions and traditions

that have helped to perpetuate global economic and social imbalances. Such a disruption offers long-term benefits not only for developing countries but across the world. This disruption needs to take place at a foundational level. It requires courage on the part of university leaders. Truly diverse thinking in the academy allows us to challenge our traditional world view of science and ask fundamental questions.

In South Africa, the word "transformation" refers to the political evolution of our society: from apartheid to true inclusiveness and diversity. Like the rest of the world, we are still on this road as a nation. In seeking transformation, we need to re-examine the assumptions that exist within our society — for instance, about the relationship between excellence and transformation. In science as in any other sector, we must give up the assumption that our view of excellence is unbiased or innocent. Indeed, a narrow view of excellence is often used as an excuse to continue to exclude previously marginalized groups. When anti-apartheid struggle leader Steve Biko spoke against integration as "a breakthrough into white society by blacks, an assimilation and acceptance of blacks into an already established set of norms and code of behaviour set up by and maintained by whites" (Biko, 1979), he was addressing the practice of higher education around the world at the time.

When I became vice-chancellor of UCT in 2018, South African universities had endured three years of protest by black students and staff members who rejected the notion that, to demonstrate their value in science, they must assimilate into western versions of themselves. My executive and I opened discussions across campus about the relationship between excellence, transformation and sustainability. Of course, excellence must be the guiding principle for science. But excellence without transformation will always be called into question because it may be used to reinforce narrow ways of approaching a challenge. The wicked problems of the world demonstrate the need for scientists to transform our ways of being, doing and knowing. But, without excellence, transformation has no integrity. Sustainability becomes possible only when transformation and excellence work in tandem.

TO BE SUSTAINABLE, SCIENCE REQUIRES DIVERSITY

In South Africa, the international demographic norm for science — white, male, Western, usually heterosexual (sometimes referred to by the acronym WEIRD) — is being disrupted by the slow but gradual entry of new faces into the scientific community: African and Coloured people, along with women in far higher numbers than before, openly queer and transgender academics and those with disabilities. This diversity is necessary for science to be sustainable, for several reasons. Often, those who distrust science are not science-literate and are therefore incapable of distinguishing good research that delivers sound

conclusions from bad research that reaches biased conclusions. This is true in both the global north and the global south. But people in the global south suffer from another disadvantage that gives them reason to distrust science: all too often, they do not see themselves reflected in the global knowledge hierarchies, nor do they see the benefits of science accruing to them or their society.

My research on the use of multilingual teaching of mathematics in secondary school classrooms (some of it published under the name Mamokgethi Setati) demonstrates the need for radical new approaches in teaching, communicating and conducting scientific knowledge and research. This research focuses on how the power dynamics of language limits the ability of learners to grasp basic concepts that should be accessible to them, if they were able to learn in an environment that supports their cultural diversity.

The concepts of mathematics are universal. But when learners are constricted in what language they can use in the classroom, such as English instead of their mother tongue, their ability to grasp mathematical concepts is also constricted. This is because they and their teachers tend to focus on the correct use of English, on finding the correct English words, instead of focusing on the mathematical lesson that is before them (Setati & Adler, 2000). One result is that the 2020 pass rate for South African matriculants in mathematics was only 53.8%, down from 54.6% in 2019. The pass rate for physical science was 65.8%, down from 75.5% in 2019. Our children are not learning mathematics at the level they need to enter university-level science, engineering and technology programmes.

My research, which is supported by other studies around the world, demonstrates the politics of language, science and research. These politics arise out of the global history of conquest and colonialism, which continues to influence developing countries long after they have freed themselves from colonial governance. In South Africa, the issue of language has always been interwoven with the politics of domination and separation, resistance and affirmation. English has power in our country and, of course, around the world.

In many South African schools, English is considered the only language that provides access to important "social goods" such as a career, higher education and the opportunity to make a success of yourself. I have heard learners say things like: "If you can't speak English, there will be no job you can get." I've heard teachers say: "If you don't know English, you look like a fool, and you are considered as not intelligent." While there is no systematic research evidence, it is widely held that many schools with an African student body choose English as the language of learning and teaching from the first year of schooling, as do the parents, simply because they believe fluency in English will, in and of itself, lead to success.

I have used multilingual teaching approaches with great success in the classroom. Learners can read a problem written in English on one side of the page and in their home language on the other side. As they work together to consider the problem and develop answers, they use whatever language is comfortable for them. What is most interesting is that when they were asked about the lesson where this multilingual approach was used, most of the learners were not even aware what language they had used; their focus was on the mathematics (Phakeng, 2018).

Similar results have been observed in other parts of the world. Language diversity is the norm, not the exception. For example, in California's public schools in 2000, close to 25% of learners were identified as having only limited English skills and as many as 83% were reported as speaking Spanish as their primary language (Tafoya, 2002). But many of those Latino children were likely to have been multilingual, speaking a home language such as Maya or Purepecha.

The conclusion of such studies is that a successful multilingual approach to mathematics education needs the teacher to make deliberate, strategic and proactive use of diversity — in this case, by working with the learners' home languages. In a similar manner, university leaders need to devise deliberate, strategic and proactive interventions to create a diverse, inclusive scientific community that will rebuild trust in science around the world. We need to recognize and address the inherent political history of what we teach and how we teach science, technology, engineering and mathematics (STEM), and how we communicate our research in these areas, including language. Science literacy is a fundamental part of building trust in science.

An important beginning is for leaders of higher education and research to encourage and embrace the contributions of previously marginalized groups. Women, people of colour, people with disabilities, people from economically poor backgrounds and people of different cultures, languages, religions and nationalities can provide perspectives that have been overlooked in the past. This disregard has been to everybody's detriment. The grand challenges that the entire world faces today — including climate change, sexual and gender-based violence, increasing poverty and inequality, human migration and displacement due to economic or political reason, rising urbanization and the challenges we face as a result of the fourth industrial revolution — have arisen in large part because of the narrow focus of our leaders. Science, technology, governments and business have used limited resources in a way that overlooks our impact on the planet and on each other, particularly on marginalized groups. To help reverse these trends, we need the contributions of these overlooked groups in our collaborative thinking. They need to be part of the scientific project to restore our planet and to establish a global standard for the quality of life of all human beings.

At a workshop hosted by the National Academies of Sciences, Engineering and Medicine in the U.S. in 2017, Shawn Otto, co-founder and producer of the U.S. Presidential Science Debates and author of *The War on Science*, described the political basis for mistrust of science in the country. "On the right, the theme is: Liberal scientists with a socialist agenda want to control your life and limit your freedom. On the left, the theme is: Impersonal doctors, greedy corporations and mechanistic scientists hide the real dangers to health, the environment, and our spirits. Most of this political discussion has gone on without the involvement of scientists, who have largely stayed quiet for the last two generations" (Otto, 2017).

The Covid-19 pandemic has focused attention on popular distrust of science around the world. Researchers at Johns Hopkins Bloomberg School of Public Health found that "[s]imply understanding that nearly half of U.S. adults have doubts about science reveals why misinformation about the coronavirus pandemic has proliferated so easily. Across all parties, three-quarters of those who viewed social distancing as less important had doubts about science" (Barry, Han & Mcginty, 2020).

While ideology, politics and finance are the basis for distrusting science in the global north, the global south is sceptical about science simply because people who live there may not believe (or be aware) that they benefit from it. A 2018 global Gallup poll reported: "In dozens of countries, especially those with higher-than-normal levels of income inequality, less than half say science benefits people like them. However, this is often attributable to many people expressing no opinion on the matter rather than outright scepticism. Majorities in three countries — Haiti, Albania and Mongolia — did say science does not benefit people like them …. By contrast, in regions where inequality is unusually low — such as Northern Europe — the percentage who say science benefits most people is much higher." A notable exception was China, where 82% of the people polled felt their standard of living was improving. Analysts attributed this belief to "dramatic growth that has also brought broad-based economic optimism among the Chinese population" (Dugan & Crabtree, 2019).

This is not because scientific inquiry does not take place in those countries. On the contrary, European and North American researchers have worked in the global south for centuries. But, until recently, most of that research was funded and led by institutions in the global north. This situation created an unfortunate replication of colonialism, particularly since the global north tended to benefit more than the global south from the results of such research.

As Professor Thumbi Ndung'u, the Deputy Director of the Africa Health Research Institute, said in 2019: "[T]here is some positive perception about science, and vaccines in particular, and their ability to change society and improve the quality of life in Africa. On the other hand, it is worrying that

people see themselves as being excluded from the benefits of science, through the way we are doing science and the way it is being delivered. So, there's a need to bridge that gap, to ensure that science has impact in communities. After all, that's why we do science" (Ndung'u, 2019).

This perception is perpetuated by research practice around the world. Even though the global south is producing a growing number of qualified and experienced researchers in a wide range of sectors, they often play a minor role in research that is conducted within their own countries by partners from the north. A team at the Hungarian Academy of Sciences analysed peer-reviewed publications in more than 7,000 science journals, published between 1 January 1999 and 3 November 2000. They reported that "publications of research, carried out in the least developed countries, do not have co-authorship of local research institutes in 70% of the cases [even though the fieldwork was conducted by local scientists], and that a majority of the papers is published by research institutes from the most industrialised countries in the world" (Dahdouh-Guebas *et al.*, 2003).

The practice of parachute science has been discussed widely. It usually focuses on the disadvantages to the development of research capacity in the global south. However, parachute science, and the underlying assumption that Western tradition and research practice is the only legitimate platform for scientific inquiry, is just as detrimental to the global north, because it prevents researchers in that part of the world from the necessary give and take of scholarly debate with the different ways of thinking, perceiving and analysing that scientists from the global south can provide. In a similar vein, previously marginalized groups offer perceptions that can contribute to a more holistic view of the world and to efforts to address our wicked global problems.

EMPATHY'S CRITICAL ROLE IN SCIENCE

For example, the late Professor Tania Douglas, a Black South African woman, co-founded the African Biomedical Engineering Consortium because of her belief that Western biomedical solutions did not meet the needs of Africans. She was fond of opening talks with a photograph depicting what she called an equipment graveyard: the "typical final resting place for medical equipment from hospitals in Africa", as she said in a TED talk. She pointed out that most medical devices that are imported to Africa are not designed for local conditions, they are difficult to operate, maintain and repair, and they are likely to require a reliable electricity supply, which is not usually available in rural Africa. (Douglas, 2017).

Professor Douglas advocated for African-based solutions. She said: "We already have a strong and rich base of knowledge from which to start finding solutions to our own problems. So let's not rely too much on others when

we live on a continent that is filled with untapped talent." A critical component of developing African-based biomedical solutions was what one of her students described as learning to design with empathy: in other words, taking biomedical engineers out of the lab and workshop and into "real-world situations, in which they can learn to understand local healthcare needs as well as the context in which technological solutions will be implemented" (Douglas, 2012).

Diversity reinforces the power of science through academic debate, the exercise of free expression to explore new ideas and the exposure of conscious and unconscious cultural biases that may influence a researcher who is working in a foreign field. Daniel Akinbosede, a doctoral tutor in biochemistry at the University of Sussex, has pointed out that these benefits are important for everyone. "[E]ncouraging science students and academics to confront and discuss race in the context of their subjects might increase engagement and a sense of belonging for students of colour. But it's also important for white students. All students need to understand the historical context for what they learn — a critical first step in ensuring history does not repeat itself" (Akinbosede, 2020).

This type of disruption needs to take place at a foundational level. It requires courage on the part of university leaders. Truly diverse thinking in the academy allows our traditional world view of science to be challenged and fundamental questions to be asked. Indeed, South African higher education has recently been embroiled in two different research controversies that might have been avoided if academics and editors had been more aware of the need to acknowledge the different mindsets that exist in our highly diverse national culture.

Both of these controversies revolved around the question of how methodology might influence the outcome of a research project. Two papers were published that discussed research focusing on the possible effects of race in two different areas. The first focused on cognitive functioning, the second on the decision to study biological science.

The first paper, "Age- and education-related effects on cognitive functioning in Coloured South African women", by a team of Stellenbosch University researchers, was published by the UK journal *Aging, Neuropsychology and Cognition* in 2019. It was retracted in 2020. ("Coloured" has been a legal racial classification in South Africa since apartheid. It designates a multiracial ethnic group.) The article suggested that Coloured women had an increased risk for low cognitive function because of low education levels and unhealthy lifestyle.

In retracting the article, the journal explained: "While this article was peer-reviewed and accepted according to the Journal's policy, it has subsequently been determined that serious flaws exist in the methodology and

reporting of the original study…. Consequently, the Editors and the Publisher have taken the decision to retract this article."

Stellenbosch University issued an apology and conducted a formal investigation which concluded that "the researchers naïvely regarded the content of the article as compatible with the research trends in their discipline." (Cloete, 2020). It could be argued that greater diversity among members of the Research Ethics Committee at the start of the project might have led to a revision of the study and an avoidance of the controversy it raised.

Overlapping this chain of events, in May 2020 an academic in UCT published a commentary in the *South African Journal of Science* (*SAJS*) titled "Why are black South African students less likely to consider studying biological sciences?" (Nattrass, 2020). Academic censure of the article was so fervent that the *SAJS* published a special issue devoted to these various commentaries (Carruthers & Mouton, 2020). The titles of the 12 academic responses ranged from "The Anatomy of a Bad Science" to "Black — And Not Offended" and ended with a response by the study's author, Professor Nicoli Nattrass, titled "In Defence of Exploratory Research — A Reply to Critics".

This time the controversy centred on the assumptions underlying the questions asked by the white researcher in a 2019 survey that was completed by 211 UCT students who identified with various race groups. The criticisms focused largely on "three distinct issues with Nattrass's commentary. First is the methodological deficiencies in the study design. Second is the dissonance between the results of the regression models in the commentary and the conclusions that Nattrass drew. The third is the extent of the corrosive effects of the author's presuppositions and prejudice on the premise and reporting of the study." (Adesina, 2020).

The academic discussions around these two reports yielded a set of questions that are relevant to science around the world today. They include: What are the basic rules of scholarship — and is it time that we revised them? Who determines what are the relevant and ethical questions to ask in a survey? Does the race of the researcher matter in research that is focused on subjects of a particular racial group? Do we need to develop standards for how we explore a deeply complex issue such as the possible relationship between race and the choice of a career? Who decides what is excellent in science and what is not? The *SAJS* itself noted that there may be room for review in its own editorial policy, saying: "We acknowledge that the current guidelines pertaining to the 'Commentary' section need to be reviewed and, if required, be changed, specifically in regard to what necessitates peer review." (Carruthers & Mouton, 2020). If one of the gatekeepers of academic integrity in South Africa is questioning its own editorial practices, is it not appropriate for similar questions to be raised on an international scale?

Inherent bias is emerging as a dangerous hazard in data analysis. Joy Buolamwini, a Ghanaian-American computer scientist and digital activist

based at the MIT Media Lab, founded the Algorithmic Justice League (ajl.org) to challenge bias in decision-making software. Her research has found that facial recognition error rates in commercial artificial intelligence (AI) services are only 0.8% for light-skinned males, but 34.7% for dark-skinned females (Buolamwini, & Gebru, 2018). Thanks to AI race bias, a Google online photo service assigned photos of Black people into a folder called "gorillas" (Metz, 2021). A survey on Diversity in U.S. Data & Analytics in 2020-2021 reports that only about 3% of data scientists in the U.S. identify as Black (Harnham, 2021).

Gender bias is also creating a distorted AI view of the world. A report in *Forbes* says: "[O]rganisations will always fail to harness the fullest capacity of their digital innovations without including women, as machine learning technologies will be fed a constant stream of biased data, producing junk results that are not reflective of the full picture, causing potentially catastrophic harm to organizations." (Minevich, 2020). As AI technology gains momentum in various applications and is used more widely, such biases can only serve to exacerbate both inequality and public distrust in science and technology.

Women in STEM sectors around the world share similar challenges, including the fact that they are in the minority. The Alliance for Accelerating Excellence in Science in Africa — a partnership of the African Academy of Sciences and the African Union Development Agency — summarized the main barriers for African women in STEM as: pressure from family responsibilities, patriarchal attitudes in society, unconducive work environments and low remuneration relative to men in the same position (Mukhwana, Abuya, Matanda, Omumbo & Mabuka, 2020).

Similarly, students from previously marginalized ethnic groups around the world share many of the same struggles to enter higher education and rise in academic careers. U.K. Research and Innovation (UKRI), reported in 2019 that lead researchers who were white won grant proposals 27% of the time, while those from ethnic minorities were successful 17% of the time. This was based on data recorded between 2014 and 2019. The report says: "[W]e can now evaluate and assess our Council approaches to fairness with the ultimate goal of producing a single policy on managing and minimising bias — including the use of diversity training. It should be noted that evidence on the effectiveness of unconscious bias training is contested, suggesting that while helpful in raising awareness, it is not sufficient by itself to change behaviours or mitigate the impacts of bias and in some cases may actually exacerbate the effects of bias." (Walport, 2019).

CONCLUSION

Despite UKRI's reservations about addressing bias, such barriers are surmountable. A large body of research has already been collected on many of these obstacles. To remain sustainable in a world where trust in science is eroded as a result of traditional bias, the logical step should be to address such bias head-on. This step must be based on excellence working with transformation, through the creation of a pipeline of well-supported researchers at senior and junior levels, along with graduate students and postdoctoral fellows, who represent previously marginalized races, genders, cultures, languages and sexual identities: the non-traditional thinkers who can rebuild trust in science and ensure its sustainability as they contribute to new scientific approaches to the many problems that have been created by old scientific models.

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Chapter 8

University on the stage of grand challenges

Sabine Kunst

INTRODUCTION

"Art is the only form in which environmental problems can be solved" (Innovator's Guide, 2021). This was the conclusion of German performance artist Joseph Beuys. When Beuys planted 7,000 trees in Kassel between 1982 and 1987 for the art exhibitions documenta 7 and 8, he brought the relationship between art and sustainability into the public eye worldwide in several ways. With this initiative, Beuys drew attention to the ecological crises of the 1980s, uncovered the crucial influence that humans have on the natural environment and campaigned for the return of green nature to the urban spaces of the post-war period. In the 80s of the last century, these were primarily characterized by their car- and consumer-friendly planning. The concerns of nature, on the other hand, barely played any role. It was at this type of urban planning that Beuys' art project in Kassel was directed, but also at the city's citizens and visitors. The trees require their appreciation, their care and attention. Beuys thus created the first "social sculpture": a new form of art aimed directly at the people, that encourages creativity and aspires to actively shape society (Stockmeyer, 2012). Science only featured indirectly here. Yet, in order to tackle the Grand Challenges of the future, it is important to unite science and art.

Forty years after Beuys' spectacular tree campaign, our society is faced with an inescapable decision as to which direction to go in. "Anthropos" — humankind — is encroaching upon the earth system in a way that has never been seen before — with consequences for both nature and humans

themselves. Earth Overshoot Day (2021), the day on which mankind has used up all the resources that are naturally generated in a given year, is moving further and further forward in the calendar. In 2019, the year before the coronavirus pandemic, it came as early as July on a global level, and, in 2021, for Germany, as early as 5 May. In December 2020, researchers in Israel published a study which stated that the earth had also reached its "crossover point". For the first time, the mass of manmade items worldwide exceeded the mass of all living things on earth (Elhacham *et al.*, 2020). In the Anthropocene, the world has ultimately fallen out of balance. The days where only Fridays for Future activists were calling for a radical change of course in politics, the economy and society are behind us.

The universities and their academics have so far acted primarily as instigators and admonishers. We provide facts and figures, work out climate projections and publish horror scenarios. Yet, universities are more than just research institutions and are thus also presented with new and different opportunities to influence and work on the big issues of our time. That is why we are increasingly investing not only in research and teaching, but also in the exchange with politics, media and society — in our new third mission.

In the spirit of its founding fathers, the great explorers and scientists Wilhelm and Alexander von Humboldt, Humboldt-Universität zu Berlin has developed *Open Humboldt* — a strategic programme that combines cutting-edge research with new approaches in art and culture. We invite the public to actively participate in the emergence and growth of science. With interactive performances, exhibitions or even everyday art, people are spoken to, taken along and, as with Joseph Beuys, motivated to play a part in building a sustainable world. The university becomes a stage for the great questions of the Anthropocene and for new ideas for a sustainable society.

OPEN HUMBOLDT

The Grand Challenges of our time are manifold. The world in the Anthropocene is not only confronted with manmade climate and environmental crises. Endangered democracies, the increase in forced migration and displacement, and global health problems, such as child mortality, malnutrition and access to medical care, require new solutions for sustainable social cohesion just as urgently as inexorable climate change. In order to meet the challenges of a globalized society, the United Nations adopted its Sustainable Development Goals in 2015 (United Nations A/70/L.1., 2015). These 17 Sustainable Development Goals (SDGs) aim to bring economic progress into harmony with an ecologically viable and socially just world. However, this path requires not only political efforts and a change in economic thinking, but, above all, increased exchange within civil societies, in all their diversity.

The 17 SDGs provide the basis for a sustainable future and are therefore the focus of *Open Humboldt*. Addressing and activating the population through interactive art initiatives and new formats of cultural education forms lies at the core of *Open Humboldt* and is predicated on two preconditions: firstly, on interdisciplinary research into sustainability in the faculties of Humboldt-Universität, and, secondly, on bundling the activities of students and academics so as to promote the sustainability goals within and outside the university.

Step 1: Research is and remains the core competence and greatest treasure of the university. The problems of sustainable living have long since made their way into the diverse array of research disciplines and approaches. Here — at Humboldt-Universität — the 17 SDGs are illuminated and addressed across the entire spectrum of perspectives offered by the humanities, cultural studies and life and natural sciences. Qualitative and quantitative research and empirical and normative approaches are interconnected. At Humboldt-Universität, this research takes place in its own research facilities, such as the Berlin Institute for Integration and Migration Research (BIM), in interdisciplinary centres like the Georg Simmel Center for Metropolitan Studies, and in numerous scientific collaborations in and outside Berlin. Under the umbrella of the Berlin University Alliance (BUA), for example, academics from Freie Universität Berlin, Humboldt-Universität zu Berlin, Technische Universität Berlin and Charité — Universitätsmedizin Berlin conduct research into the Grand Challenges of our time, such as *social cohesion* or *global health*.

At the Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys) at Humboldt-Universität, researchers from the humanities and social and natural sciences primarily apply themselves to SDG No. 15: "Life on Land". According to the UN Sustainable Development Goals, this involves striving "to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (United Nations, 2015, p. 24). Against the background of the concept of planetary boundaries (Steffen *et al.*, 2015), which include climate change and biodiversity integrity, researchers at IRI THESys pay particular attention to the overlaps between land use practices and issues of water and energy use or governance. This includes research into food and fuel production, resource extraction and water and biodiversity management, as well as studies on the relationship between urban centres and their regional and global hinterland. The project "Water Security for Whom?", for instance, brings together an interdisciplinary team of researchers from IRI THESys, the Pontificia Universidad Javeriana and the Universidade Federal de Minas Gerais, who investigate inequalities in water security across the water-energy-food nexus, concentrating on the case of multipurpose reservoirs in Colombia. Building on the large body of literature on conflicts surrounding the construction of

hydropower plants, the project advances research into the post-construction phase of multipurpose reservoirs and in post-conflict societies. In recognition of the fact that the socio-ecological effects of dams — and their operation — are unevenly distributed across social groups and geographies (Matthews & McCartney, 2018), the researchers investigate how and to what extent the water security of social groups can come at the expense of the water or food and energy insecurity of others. The focus on SDG No. 15 is thus expanded to include social and institutional dimensions of sustainable life on land, as well as the interactions between social and material dimensions. The researchers therefore view the relationships between land use practices and food security and sustainable agriculture (SDG No. 2), water and energy supply (SDGs Nos. 6,7), old and new infrastructures (SDG No. 9), urban development (SDG No. 11), consumption patterns (SDG No. 12), and the domain of strong and just institutions (SDG No. 16) against the background of climate protection (SDG No. 13).

Step 2: The commitment to the United Nations Sustainable Development Goals goes hand in hand with the realization that such research projects must go beyond disciplinary and interdisciplinary work and require close engagement with stakeholders and various publics. Researchers at Humboldt-Universität are involved in movements such as "Scientists for Future" (Hagedorn *et al.*, 2019) and, in 2019, initiated a new edition of the popular KOSMOS lecture series by Alexander von Humboldt from 1828/29, which is still running today. The prelude to this was a large international conference in August 2019, out of which emerged the "Berlin KOSMOS Invocation for Sustainability Transformation", a call to all "politicians and social and economic actors around the world to finally and substantially move from Knowledge to Action" (Kosmos, 2019). The researchers work hand in hand with students, who, as part of the Sustainability Office student initiative, have got their own course offering off the ground with the *studium oecologicum*. This offer has enjoyed great popularity for years now and combines the commitment of the young generation with scientific work on ecological sustainability (Sustainability Office, 2021).

STAGES OF THE ANTHROPOCENE

For many members of Humboldt-Universität, exchange and knowledge transfer are a part of how they see themselves — in the academic environment and beyond. Researchers are being called upon to address the global challenges of the 21st century. With *Open Humboldt,* the university is embarking on an "expedition" with an open outcome, very much in the spirit of its founding fathers, Alexander and Wilhelm von Humboldt. In a new kind of partnership

with stakeholders in politics, society and culture, and with new projects and formats, we collaborate on relevant questions and problems.

HUMBOLDTS17.DE

Prompted by the efforts and activities of its academics and students, Humboldt-Universität developed an online presence on sustainability: the *humboldts17* sustainability portal. Since December 2020, research topics relating to the core theme of sustainability have been bundled on this portal, and interested researchers and citizens have been invited to take part in an exchange between academia and the public (Humboldts17, 2020). At the heart of the sustainability portal are specific research projects from various subject areas. These digital excursions into the world of transdisciplinary research are called "expeditions" — in memory of Alexander von Humboldt's research trip to America from 1799 to 1804. Academics at Humboldt-Universität provide insights into their everyday work and analyse what challenges are presented when implementing the sustainability goals. Using discourse, cooperation and networking as essential tools, *humboldts17* creates a platform to develop a transdisciplinary network through artistic interventions.

SCIENCE ON THE PLATFORM EDGE — THE SCIENCE STATION

On 4 December 2020, a new underground station opened its doors beneath Berlin's most famous boulevard, Unter den Linden. Once the pandemic has receded, 150,000 passengers are expected to board, alight and change trains here each day. A dozen metres below ground, a science exhibition that engages with some of the most significant questions of our time has since been awaiting passengers. Exposition elements of different sizes, colours, types and origins populate the panels in the underground station in the direct vicinity of the cultural and political centre of Berlin. Where users would usually expect product advertising, richly detailed pictures of hidden objects and word clouds shift from one image to another on the walls behind the tracks. In the process, terms from science and everyday life build bridges between the worlds. They all invoke objects, substances and processes that are a vital part of our present lives in all their multifacetedness. The exhibition aptly demonstrates that the smallest and largest of things, the individual and the innumerable, and geological, biological and man-made processes are interconnected in a variety of ways.

At the same time, the exhibition on the platform edge visualizes a wide array of themes of the Anthropocene without providing any ready-made

answers to the commuters, tourists and rail passengers that pass through the station. Rather, travellers are invited to pause for a moment, to stop and let the many details of the pictures work on them. What fascinates? What incites fear? The disjointed word clouds raise questions and, in the best case, stimulate contemplation — of our everyday life, our personal behaviour and their consequences for the Anthropocene.

"AFTER NATURE" — HUMBOLDT LAB

With the Humboldt Lab in the Humboldt Forum, we have over the past three years established another location in the heart of Berlin to set up a place for dialogue between academia and society. This dialogue completely reconceives the field of *knowledge exchange* and is geared towards and reliant on the participation of its visitors. Across roughly 1000m^2 of exhibition and event space, visitors will find various — and also low-threshold — points of access and insights into current research processes. Academics from different disciplines and of levels of qualification have worked on innovative formats for knowledge transfer and science communication and plan to develop these formats further.

The inaugural exhibition at the Humboldt Lab, entitled "After Nature", addresses both the destruction of species and ecosystems and the possibility of learning "from nature" in equal measure. The exhibition illuminates the interactions between climate change and biodiversity loss as well as the global crises of democratic principles of order. For this purpose, the curators of the exhibition have gathered research approaches to current research questions and related them to positions from the history of science. In this process, the exhibition and the accompanying educational and supporting programme neither reduce nor simplify the complexity of research topics. Rather, visitors are given an understanding of questions with complex answers and a way of dealing with this complexity in a responsible and sensitive way. How can the demand to curtail our consumption of resources be reconciled with the belief in growth imperatives and profit-based thinking? How can sustainability be achieved within a political order that is oriented towards short-term electoral success? Knowledge, thought and research are often very protracted processes. The Humboldt Lab invites the public to participate in these.

The entrance to the exhibition is playful and arouses the desire for discovery. An animated school of fish receives the public and invites them on their own scientific expedition. The projected fish react to the visitors, follow their movements with curiosity or retreat and thereby illustrate that individual behaviour has a direct effect on swarm behaviour. The school is a playful exploration of human–environment relationships and symbolizes the sensitivity of ecosystems. At the same time, it represents the way of

working of the seven interdisciplinary and overarching Clusters of Excellence of the Berlin universities, which are introduced in the foyer of the exhibition. Within these clusters, outstanding scientists conduct research in teams — in swarms, as it were — because the global challenges of the present can only be solved through the interaction of subjects, institutions and competencies.

The "Matters of Activity" Cluster of Excellence, for example, brings together the competencies of researchers from 40 different disciplines. They investigate the properties of active materials and how these can be harnessed for sustainable, energy-efficient technologies. With the "Active Curtain Project", the cluster enables visitors to the Humboldt Lab to take part in ongoing research. The "curtain" consists of various structures, made of bacterial and vegetable cellulose, which actively react to environmental factors and distort depending on the climate in the room. The experimental set-up shows how nature can be used to create a sustainable relationship between humans and the environment. As a further central element in the exhibition, a kinetic projection screen with movable roller blinds extends over the entire length of the main hall. Around 120 minutes of film material reveal the complex connections between the crisis of nature and social crises, as well as possible solutions. Here, scientists, such as those from IRI ThESys, get a chance to speak. At designated points, guests are invited to participate directly in the discussion via smartphone. Science is thus not simply transferred into the Humboldt Forum, but rather comes into being on site through productive exchange relationships between science by researchers, student science and citizen science.

THEATRE OF THE ANTHROPOCENE

Humboldt-Universität has also been performing on its own theatre stage since 2019. The *Theatre of the Anthropocene* was established as part of the *Open Humboldt* strategy in collaboration with the Helmholtz Centre for Polar and Marine Research. Directed by the Berlin dramaturge Frank Raddatz, it sees itself as a classic travelling theatre that opens up both the academic and natural spaces of the university for its range of offers. It is precisely on this stage where art, science and society join forces to approach the challenges of the Anthropocene from both a scientific and artistic perspective. The overall concept of the theatre is based on the fundamental conflict of "man and nature in the Anthropocene" and is not reduced to performances on a traditional theatre stage. The *Theatre of the Anthropocene* makes use of resources from the theatre landscape, urban interventions and scientifically illuminated city expeditions to promote networking and intensive collaboration between artists, researchers and civil society on ecological issues and themes of the Anthropocene.

A central approach of the *Theatre of the Anthropocene* lies in overlaying scientific and aesthetic perspectives. It is the prototype of a stage that, against the backdrop of the 21st century, rises to the challenges of a natural world that has been set in motion. Like no other artistic medium, the theatre is predestined to test, put forward for discussion and instigate fundamental upheavals in accepted societal conditions within the context of the Anthropocene. The *Theatre of the Anthropocene* understands nature as a network-like overall context in which the fates of humans are inextricably linked with those of animals, plants, waters and oceans, as well as the atmosphere and ecological systems. The interactions between humans and nature are presented theatrically to allow ecological issues to be experienced emotionally and to evoke a new sensitivity that aims to revive the social relationship between human and non-human life. Due to the involvement of representatives from science and research in the artistic activities, current discourses and findings which otherwise only get to be heard by a narrow circle of experts are made accessible to a wide audience. This collaborative interaction was tested for the first time in the staged reading of *Requiem for a Forest*, in which the cultural history of humankind and forest is illuminated from an artistic and scientific perspective.

In the *Theatre of the Anthropocene*, the theatre audience themselves become part of the stage work. Within the context of the *Theatre of the Anthropocene*, the additional format of the *Inventive Expeditions* invites people from civil society, science and art to themselves embark on small, independent expeditions into their supposedly familiar environment and to experience it with a new, curious, focused perception. The *Inventive Expeditions* were developed by the foundation AlltagForschungKunst to break down the great questions of species extinction and climate catastrophe in collaboration with scientists from Humboldt-Universität and interested parties among the city's population. As a specific *citizen science* approach, it is an impulse into action and, at the same time, provides new questions, data and problems for future research. The first *Inventive Expeditions* led to the habitats of trees in the city: in the arboretum of Humboldt-Universität, on motorway access roads, at the wayside of central traffic hubs and in small corners of green parks.

The Open Humboldt Strategy is inspired by Alexander von Humboldt's conviction that only an intact bond between people and nature, woven from knowledge and experience, empathy and emotion, can provide the basis for a sustainable civilization. We are convinced that knowledge alone will not change people's actions. This shift also requires emotion. Ecological problems such as emissions in the atmosphere, the acidification of the oceans and the loss of biodiversity are just as much a focus of the individual projects as questions of democracy, migration and even religion, questions of law and justice for society and nature.

We are therefore also building on Joseph Beuys' trenchant idea of the 7,000 oaks for the urban space of Kassel. People experience the issues of the Grand Challenges and the challenges of the Anthropocene in their immediate environment, artists draw unfamiliar lines between humankind and nature, and researchers explore and provide new questions that concern us all. The Sustainable Development Goals do not remain empty words, but rather find their way into people's lives, accompanied by the expertise of science and the forms of art. The university thus unites important forces that can spur people to action and strives, as a new stage, to get to the heart of current societal debates.

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PART III

How Universities Contribute to Efficient Public Policy-Making

CHAPTER 9

The Role of the University in Public Debate

Michael Spence

INTRODUCTION

In an age of wicked problems, our communities increasingly look to universities for guidance. This trend is only likely to grow as the number of institutions that can speak into public debate with authority declines, and as governments look to universities for a "return" on their research spending. But for universities this trend presents real challenges. These are not merely the obvious challenges; that the work of universities is often organized around disciplines and the wicked problems our community faces do not fit neatly into disciplinary categories; that the claims of academics are often nuanced, and the claims mostly easily heard in a claims-saturated community lack nuance altogether. They go to the very social purpose of the university as an institution. Universities in the liberal tradition, as institutions, are best seen as fora for, and not participants in, debate. Indeed, on any given issue, a good university is likely to have keen advocates for completely opposing approaches to a given social or scientific issue. What then is its role in public debate? If the university is a "forum", when, if ever, is it appropriate for it also to be a "voice" in the public conversation? Can the university adopt a position on matters of public debate? And when, and to what extent, is it ever responsible for the ideas and speech of its staff and students?

THE UNIVERSITY AS A FORUM FOR DEBATE

Given the extent to which universities are profoundly enculturated institutions, and understandings of their role vary over time, place, culture and even sub-culture, it is difficult to speak of the "the university" as a kind of idealized hypostasis. That's part of the reason, methodological difficulties aside, that the so-called "rankings" of universities make so little sense. But it is possible to speak of "the university" within a given cultural and political tradition, and the kinds of universities in which I have spent my working life are research-intensive universities operating in the context of the Anglophone liberal democracies.

Within that tradition, one of the best accounts of the function of the university has been offered by the political philosopher, Ronald Dworkin. In his article "We Need a New Interpretation of Academic Freedom", Dworkin conceives of the university as a kind of "theater … in which personal conviction about truth and value is all that matters, and … [where] scholars and students alike [are trained] in the skills and attitudes essential to a culture of independence" (Dworkin, 1996). That culture of independence is in turn essential to the maintenance of the "ethical individualism" which is at the core of liberal societies, an ethical individualism which "insists, among its other components, that we each have responsibility for making as much of a success of our lives as we can, and that this responsibility is personal, in the sense that we must each make up our own mind, as a matter of felt personal conviction, about what a successful life for us would be". Academic freedom is therefore not something desirable that may or may not be part of the life of a university, it is central to the very concept of a university itself. By academic freedom is here understood a whole cluster of concepts including, but extending beyond, freedom of speech, that involve: the freedom of staff and students to explore and communicate ideas unfettered by unreasonable restraint; their freedom to participate in the governance of their institution; and a certain degree of institutional freedom from unreasonable government interference.

I should note, incidentally, that in advancing this concept of the university, and of the core function of academic freedom within it, Dworkin is quick to dismiss what he calls the "instrumental" justification of academic freedom, that "[w]e have a better chance of discovering what is true … if we leave our academics and their institutions free from external control to the greatest degree possible." While this justification for academic freedom undoubtedly has its limits, it is also true that liberal democracies have seen the enormous productivity, as engines both of innovation and social change, of institutions in which both students and staff enjoy more, rather than less, freedom of this kind. For that reason, it ought not to be altogether abandoned.

If this conception of a university is taken seriously, it means that the university exists, not as a single corporate entity, but as a community of

ethical individuals, each with very different, and sometimes wildly opposing, conceptions of truth and value. The role of the university is to provide the context in which that ethical individualism can flourish and in which each member of staff and student is able to pursue, in Dworkin's terms, her own conception of the "successful life". Understood in these terms, the university is best described as a kind of forum for debate, and the duty of those charged with leading the university is to promote, and not to chill, far less to stifle, debate amongst staff and students and their capacity to exercise their academic freedoms. There has been debate as to whether the university has a duty to promote the ethical individualism of only academic, or also professional and support staff, but it is at least arguable that the university works best to fulfil its core purpose when a certain "academic" freedom is enjoyed by all members of the community, by all staff and all students.

TWO IMPLICATIONS OF THIS CONCEPTION OF THE UNIVERSITY AS A FORUM FOR DEBATE

This conception of the role of the university in a liberal democracy is not without its critics, and there are at least two currently contentious areas in which it has implications for the work of universities and their leaders.

Can the university, as an institution, promote particular conceptions of truth and value in the public conversation?

If the primary function of the university is to create the conditions in which staff and students can develop and exercise the ethical individualism core to the maintenance of liberal democracy, then it is hard to see how the university itself can enter public debate as an advocate. The university cannot both be a forum for debate and a participant in debate in a way that does not chill the exercise of the ethical individualism of its staff and students. Assuming a plurality of views amongst staff and students on any issue worth debating, the institution itself cannot tip the balance of the debate by siding with one side over another. In that this is true of the university as an institution, it must also be true of the senior officers of the university, such as presidents and chairs of governing bodies, in any context in which they may be taken to represent the views of the institution as a whole. Even if it could be shown that on a given matter of public debate every member of a university held a particular opinion, it is arguable that the university itself promoting that opinion could limit the capacity of an individual member of staff or student to change her mind, and thereby threaten her ethical individualism.

This principle, entailing as it does a deep commitment to academic freedom, is not without its limitations. Four of these raise important practical issues.

The first, is that it is wholly legitimate for a university to assist its staff and students in making their voices heard in the public conversation. It can and should promote the work of staff and students as examples of the contribution that the university makes to the public search for truth and value. In that sense, the university can speak into public debate. In recent decades, keen to shore up their social licence to operate, to demonstrate relevance and gain competitive advantage, universities have built media teams and measured their media share. But our claims should always be that "researchers at University College London have …" rather than "University College London has …". It is a subtle, but important, difference. Incidentally, a commitment to ethical individualism does not entail an obligation on a university equally to promote the work of all its researchers for the reasons outlined in the following paragraphs. The university does not have to use its resources to ensure that all staff and students have a similar platform.

Second, it is impossible, and undesirable, for a community to abstain from establishing norms for the conduct of its own collective life. Decisions are made every day that involve the university, as an institution, affirming certain things as true and endorsing particular values. But making those choices about the collective life of an institution is different, if again subtly different, to entering the public arena as an advocate. It is possible for a university to establish norms for the conduct of its collective life and yet remain a forum for open debate. An example might drawn from my time as Vice-Chancellor of the University of Sydney. I was very proud that the University worked hard to ensure the flourishing of, and to protect from any kind of discrimination, our LGBTQI staff and students. But when the issue arose as to whether the University would enter the public debate surrounding a national referendum on same-sex marriage, I did not think it was appropriate for the University to take a stand. Given the state of the law in Australia, the referendum was essentially one concerning the meaning of marriage. That was something regarding which there was, within the University community, a diversity of views, including both a majority view in which the meaning of marriage simply extended to cover same-sex unions, and a minority view in which it did not. The University needed to make space for both voices to be heard in debates both inside and outside the institution. The question as to whether that is true in relation to all "voices" is something to be considered in the next section.

Third, given that the university can establish norms for its own collective life, are there any to which it must necessarily commit? If the university is to be a forum for debate, it is at least arguable that it must have some role in

establishing the ground rules for disagreement. A good place to start is the conscious promotion amongst staff and students of the epistemic virtues, a set of the principles for disagreeing well. For the purposes of a similar exercise at the University of Sydney, I collated a list of those virtues that claims no originality. Many such lists exist, but they always include things such as:

- "an empathetic willingness to listen carefully and be open to the opinions of others
- a recognition of the particular expertise and experience of individual participants to a dispute
- a recognition of the particular responsibilities within the organisation of any individual participant in the conversation
- a choice of language commensurate with the goal of increasing levels of communication and understanding
- an orientation towards finding common ground with the other
- a desire to identify with some precision those points on which difference exists, rather than to create an 'enemy' of the other."

So-called "civility codes" have often been criticized as a way of silencing dissenting voices, but a focus on a rules of engagement to any disagreement can actually ensure that more voices are heard, and heard more clearly. The difference between the two often lies in the extent to which the epistemic virtues are promoted, or policed, by university managements (though both are to some extent necessary). That these can be complex waters to navigate is evinced by the debate over the University of Cambridge Statement on Freedom of Speech in late 2020 (Cambridge Speech, 2020) in which staff objected to the notion that the University expected staff, students and visitors to be "respectful" of others and insisted instead that the Statement should require them to be "tolerant".

Fourth, while the university must create space for academics freely to follow their intellectual passions as an exercise of their academic freedom, it can require that they undertake particular types of task at a particular standard, and it can use its resources to focus the work of the institution in particular areas. It almost goes without saying that if academics are paid to teach and research, that means teaching and meeting reasonable, and nuanced, expectations of research productivity. While the university is a community of ethical individuals, it exists for collective purposes in teaching and research and a demonstrated commitment to those activities is a condition of membership. Indeed, it is not unreasonable for a university to require that the work of its academic staff meet certain perceived quality thresholds (for example, that it is work of a quality that merits publication in peer reviewed journals), as long as those quality thresholds are transparently articulated and fairly applied. Finally, a university can reasonably set institutional priorities for

teaching and research, or meet the legitimate interests of governments, other research funders, and the community more broadly, that the research and teaching it undertakes addresses particular community concerns. In other words, although it is sometimes invoked in these ways, academic freedom is not the last refuge of the indolent or underperforming, nor does it preclude the creation of an institutional research and education strategy, or the directing of resources to priority areas.

To what extent is the university responsible for the views of its staff and students?

The flip side of the question of whether a university can, as an institution, promote particular conceptions of truth and value is the question of when the university might be regarded as responsible for the views of its staff and students and, by extension, those whom they invite onto campus to speak. One of the ironies of the current political environment, at least in the Anglophone world, is that many of the same voices keen to promote free speech on campus are the quickest to complain when there is speech at the university that they find repugnant. It is increasingly true that some on both the left and the right of politics expect university administrators to intervene when they object to things said either in the classroom, or by visiting speakers. Three questions have proved particularly knotty in this context.

The first is the extent to which the principle of academic freedom protects all lawful speech. Almost everyone agrees that a university can intervene to prevent hate speech, speech promoting terrorist violence and other kinds of unlawful speech. Of course, the practicalities in this context can be difficult because it can be difficult to know, *ex ante*, how likely it is that a visiting speaker might engage in unlawful speech. But, within reasonable limits of uncertainty, the principle that a university need not to permit, or is justified in taking action against, speech that is unlawful, is broadly accepted. Similarly, most commentators would agree that limits can be placed on speech on public order grounds; that it is reasonable, for example, for a university to prevent the visit of a speaker if it is likely to give rise to public order issues that the police advise cannot reasonably be controlled.

But the question is whether limits on lawful speech, in contexts in which public order is not an issue, might still be regulated by a university. Where an institution has implemented a civility code of some sort, it is arguable that it can regulate the manner of speech, if not its content. But some have gone further and argued that there are types of lawful speech which a university can legitimately regulate. In March 2019, the Australian Government commissioned a *Review of Freedom of Speech in Australian Higher Education Providers* (Australian Review, 2019). The review gave rise to a Model Code

for the Protection of Freedom of Speech and Academic Freedom in Australian Higher Education Providers, paragraph 6 (c) (iii) of which provides that a university may refuse permission to an external speaker "where the content of the speech is or is likely to … involve the advancement of theories or propositions which purport to be based on scholarship or research but which fall below scholarly standards to such an extent as to be detrimental to the university's character as an institution of higher learning". The clause only applies to visitors. Presumably this is because the author of the Code made the assumption that the usual quality control processes of the academy will deal with the issue of staff and students of the university engaging in speech of this kind, an assumption that might be regarded as optimistic in some contexts. Nevertheless, the clause is radical because it would mean that a university can exercise quality control over the content of speech, at least as regards visitors.

This clause in the Australian code is arguably incompatible with the vision of the university as a theatre for the exercise of the independence of the mind that I have taken as axiomatic. The vision of the university as a forum for debate assumes that debate itself is a kind of epistemic test, and that ideas that are untrue or promote undesirable values will be exposed without the need for prior screening by university administrators. Equally importantly, the test of falling "below scholarly standards to such an extent as to be detrimental to the university's character as an institution of higher learning" is so elastic as to be extremely difficult of application. Even more problematic are attempts to limit the principle of academic freedom with reference to the "reputation" of the university. This is an area in which the brightest lines of principle turn out to be both most easily justified in theory, and most practical of application.

A second question in relation to the content-based regulation of speech by universities concerns the extent to which the university is, or is not, more responsible for the content of teaching, than for the free discussion of ideas outside the classroom. Into this question can be folded the vexed issue of whether a university has a duty to encourage, or to ensure, that teachers offer so-called "trigger warnings" when material that is particularly challenging is to be addressed in class. To some extent this depends upon a conception of university education. At its core, I believe that university education involves the education of adults (of whom a certain resilience must be assumed) in the art of critical thinking, and of effective oral and written communication. Students must be confronted with ideas that they find challenging; they must develop the voice to exercise the ethical individualism that is at the heart of the liberal conception of the university. While a university owes its students a duty of care, it cannot be a duty to protect them against ideas that they find difficult, because equipping them to assess such ideas, and to affirm or rebut them, is precisely the function of a university education. That said, a university can require that a teacher remembers the unequal power dynamic

of the teacher-student relationship and is particularly careful in the exercise of the epistemic virtues the promotion of which, I have argued, can be part of the university's function in setting the ground rules for debate. The trigger warnings debate provides an interesting context in which to think these issues through; a trigger warning establishing the presumption that certain students may be excused from dealing with particular types of material is problematic, but a trigger warning that alerts students to the possible impact of particular material and encourages them to find help in dealing with it should they need to, is no more than appropriate student well-being support.

A third issue that arises in relation to the responsibility of the university for the views of its staff and students. A complaint sometimes levelled against the contemporary university is that particular academic communities can have a tendency towards so-called "group think", and that hiring committees can engage in processes of narcissistic self-reproduction until it is almost impossible for students and others with whom the community engages to find any genuine diversity of thought. This is an interesting dilemma for a university leadership. At one level it is something about which it is entirely inappropriate for university management to take action; the ethical individualism at the core of the liberal conception of the university would be undermined by any attempt to enforce diversity upon a particular academic community. And such an attempt would, in any case, be impracticable. Nevertheless, it is possible for university leaders to commend and encourage academic communities willing to hire across a diversity of methodologies, identities and ideological commitments as part of their commitment to growing a university community in which the notion of difference is treasured and in which ethical individualism flourishes. It is arguably a lack of such diversity, rather than any history of prohibiting speech, that has led to the current debates in many English-speaking countries about the state of free speech on university campuses. Conservative communities, in particular, often feel that their voice is excluded from the university conversation and there is a danger that the academic community fails to engage meaningfully with the variety of *weltanschauungen* that shape the lives of significant parts of their stakeholder communities. While this is not something for which university leaders can "solve" in any systematic way, diversity of thought is certainly something for which they should always be arguing.

CONCLUSION

It is the argument of this essay, then, that while a university must encourage its staff and students to engage in public debate, its own role, as an institution, is to host the conversation, and to ensure that the virtues that facilitate constructive disagreement are widely promoted. This is not an easy position to

hold in a society that frequently expects universities to adopt a prophetic role, though just as frequently loves to pillory academics for doing so and expects their universities to discipline them! But it is this uncomfortable position, as host, that enables a university best to fulfil its core mission in a liberal democratic society; to be a theatre "for the exercise of the independence of the mind" and, in that, to promote the ethical individualism that makes such societies possible. Fulfilling that mission seems, in a culture of glib, passionate and often extreme argument, to be more important than ever.

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CHAPTER 10

Building World-Class Universities as Actors of Social Change and Efficient Public Policy-Making

C. Raj Kumar

BUILDING IMPACT-DRIVEN WORLD-CLASS UNIVERSITIES

Universities have always been forums of knowledge creation and exchange, and they continue to play an instrumental role in transforming nations into knowledge societies. With time, their academic freedom has been curtailed, and their significance as tools of social change has diminished. The Academic Freedom Index established by the Global Public Policy Institute (GPPi) has demonstrated that maintaining academic freedom has been a challenge for universities in several nations. Albert Einstein famously observed: "By academic freedom, I understand the right to search for truth and to publish and teach what one holds to be true. This right also implies a duty: One must not conceal any part of what one has recognized to be true."

Academic Freedom is the Core of University Governance

At the outset, it needs to be mentioned that academic freedom is fundamental to any university in the world. Democracies take pride in the fact that

they've precious spaces in society where freedom of speech is duly protected and promoted. In a democracy that celebrates freedom of expression of diverse views, ideological dogmatism of any kind, either from the Left or from the Right, will not help universities. At the heart of academic freedom is preserving democratic ideals consistently, promoting pluralism and nurturing democratic institutions.

Our challenge as educators is to recognize the complex role universities play as social organizations. No unique circumstances favour or disfavour a public or private university to promote academic freedom within its institutional context. However, there are undoubtedly historical, social, political and economic factors contributing to institutionalizing academic freedom in some societies more than others.

The fundamental objectives of university governance are based on the following three principles to promote academic freedom, while ensuring institutional autonomy. First, all recruitment, appraisal and assessment of faculty and staff ought to be entirely undertaken within the university. They must be performance-based, following the policies, rules and regulations of the university. The powers for decision-making to implement these processes must be vested in the university's leadership, which includes the faculty and staff. Outsiders, including the most generous donors, should be excluded from this process. Internal governance of a university is central to protecting academic freedom, and it has to be led by the faculty and not anybody from outside the university.

Second, all decisions relating to the formulation of programmes, curriculum, courses, pedagogy and establishment of schools/departments ought to be determined within the university as per established policies, rules and regulations of the university with all powers of decision-making vested within the faculty and staff of the university. While these decisions are taken in consonance with the laws, rules, regulations and guidelines given by the various government and regulatory bodies and based on international best practices, nobody from outside the university should exercise control or influence in these decisions.

And third, all decisions relating to the research that's undertaken by the faculty members, including their publications, ought to be based upon the principles of academic freedom and intellectual autonomy. Those faculty members who're involved in academic research ought to have full autonomy to determine the type of research projects and initiatives, including the topics of research that they undertake and the outcomes of the research. While the faculty members will be engaging in research and publications that'll speak truth to power, it should be based upon evidence, especially when the intention of the research is to inform policy-making.

Going forward, we need to recognize the importance of two central aspects of university governance for academic freedom to be meaningfully

institutionalized in universities. One, regulatory freedom. Regardless of their public or private character, universities are hugely dependent on multiple stakeholders for effective internal governance. These stakeholders are internal and external to the institution. Without achieving substantive regulatory freedom, no university can function in a genuinely autonomous manner and protect the academic freedom of faculty and students.

Two, universities need to develop a culture of transparency in which important decisions are taken after proper consultation with all stakeholders. The need for consultation, communication and consensus-building is imperative. However, for decisions to have legitimacy and acceptance, there ought to be the fundamental and foundational aspect of trust, respect and collegiality among all stakeholders. Only then will disagreements not lead to acrimonious engagements that can vitiate the academic and intellectual ecosystem, and universities must guard against that.

Universities are Social Actors and Not Corporations

Universities are unique social organizations. They are not corporations, nor are they think tanks, research organizations, NGOs, media organizations, government agencies or civil society organizations. Universities perform roles that may reflect some intentions and goals of these other entities, but they are sui generis and uniquely situated in the larger context of society.

In the celebrated work, *The Idea of a University*, John Henry Newman observed: "…If then a practical end must be assigned to a University course, I say it is that of training good members of society… It is the education which gives [them] a clear, conscious view of their own opinions and judgements, a truth in developing them, an eloquence in expressing them, and a force in urging them…"

One of the greatest challenges that universities around the world face today is in relation to their governance. University governance has become complex due to the multifaceted nature of the organization and the fact that there are social expectations from different stakeholders — faculty, staff, students, parents, accrediting bodies, government departments, regulatory agencies, international partners and donors. It is in this context that we need to recognize the role of universities in society and how to govern them in a manner that will fulfil these expectations from a diversified set of stakeholders.

While corporations have historically played a role in creating wealth and contributing to the economic and social development of a nation, they remain focussed largely on adding value to their shareholders. The social expectations from a corporation are also limited to that objective. However, there are new forms of challenges to this paradigm in which corporations are also reimagining their wider role in society. The Global Compact and the

UN's vision for implementing the Sustainable Development Goals (SDGs) encourage businesses to examine their larger role in society.

Corporations are founded on the principles of profitability and return on investment. Universities, on the other hand, are founded on the twin principle of the creation of knowledge through research and its dissemination by teaching. Universities are endowed with the responsibility of providing access to education and are involved in the democratization of knowledge.

Financial parameters such as turnover, EBITDA margin, sales, market-share and resource-utilization have temporal dimensions on which the success of a business and the corporation is measured. Even in assessing the social impact of a corporate entity, quantifiable parameters such as money invested in CSR initiatives annually or the reduction in the carbon footprint define the level of success. However, universities, for the most part, drive individual-specific intangible outcomes of intellectual growth and holistic development, inspiring young people to become transformative leaders, enabling learners to embrace the real world and preparing them for careers that can help society progress. These functions cannot be measured in quarters, financial years or, for that matter, even in a few years. We need a long-term horizon to understand the pivotal role of universities in accelerating the socio-economic growth of a nation and the vision of building a knowledge society.

Corporations measure sustainability in terms of profit, which requires maximizing revenues and minimizing costs. The steadfast focus is on generating maximum possible revenues with a productive workforce that minimizes costs. Universities, on the other hand, are constantly working on improving their faculty-student ratio that reflects the importance of specialized attention to students and the time at the disposal of faculty members to pursue original and impactful research.

Universities work in the realm of ideas — ideas that can shape the future of our society and the world at large. Many such pursuits of ideas may lead to impactful outcomes only in the long term, but it is necessary to pursue those ideas. This is true not only in the case of disciplines such as STEM and medicine, but also in broader areas of humanities and social sciences. Therefore, universities cannot function within binding organizational structures that breach the very academic freedom and autonomy that drive them.

The accountability of a university is to be achieved based on its own commitment and capacities to fulfil its stated mission, which in turn must be benchmarked against global standards of quality. The pursuit of excellence in teaching and research ought to be the most important objective of a university. The students remain at the centre of institutional governance and all efforts need to be taken to fulfil their goals and aspirations. Universities are not comparable to corporations. As William Bruce Cameron observed,

"Not everything that can be counted counts, and not everything that counts can be counted."

Building World-Class Universities for Shaping Future Public Policy

There is a need to understand and reflect upon what is needed to build world-class universities. World-class universities are built on the basis of a strong foundation that has an inspiring vision and a mission to fulfil the vision. Universities are inherently pluralistic in nature, where there is diversity of disciplines and perspectives. The vision of a university should reflect that pluralism, while recognizing that there is no one model of a university.

Universities need to re-examine their founding vision on the basis of which they were established. It helps to articulate a vision of the university even after many years of its establishment, as the vision will help in galvanizing the academic consciousness among faculty, students and staff towards fulfilling a set of goals and objectives. The vision of the university should incorporate a farsighted approach towards learning and imagination among faculty and students, but be fully conscious of the reality of the university's existing challenges.

Universities don't become world-class institutions as soon as they are created, but evolve to become world-class through long years of work pursued by the commitment and dedication of students, faculty and staff. Even then, promoting excellence is an evolving project and that is why the vision of the university helps shape its present and future.

World-class universities around the world are established and developed through a great deal of commitment of resources. However, there is not enough understanding and realization that the resources that are required to build world-class universities are significant. Arguably, the precious resources that need to be available for universities may not, and indeed, cannot come from the state. It is in this context that there is a need for promoting private, not-for-profit philanthropic universities. Deterioration in the academic standards of universities is due to many factors and thus, there is a need for a paradigm shift in the availability of funding and resources.

The role of the government in higher education and university governance, especially in developing countries of the world, deserves serious examination. At present, the role of the government in the case of state-funded universities is significant and the higher education department of the state government is deeply involved in every aspect, from the creation of the university to granting of approvals and permissions that need to be obtained for administering the university. Unfortunately, the need for external checks and balances to maintain high academic standards results in distrust in universities and their

members, and creates opportunities for vested interests and corruption at the level of government departments exercising such powers.

On the one hand, there is a need to ensure quality in universities and higher education institutions for which some degree of regulatory assessment and external accountability is essential. On the other, if we don't achieve the right balance, there is a serious risk of regulatory capture where higher education policies will not be driven by innovation and creativity in institution building, but by bureaucratic timidity, archaic rules and regulations and callous indifference of the regulatory bodies, as well as nepotism and outright corruption.

A better way to deal with this problem is to make the process of establishing a university more rigorous and transparent. The necessary conditions that need to be fulfilled to create a university should reflect the highest academic standards, availability of qualified faculty members and the necessary resources and objective measures to assess the bona fide intentions of the promoters of private universities. After the decision to establish a university is taken, the government's role should be one of a facilitator and not that of a regulator.

Universities need to provide sufficient opportunities, both in terms of time and space for pursuing research and writing. So long as we do not provide for research to be the central focus of higher education, at least in some of our premier universities, we will not be able to build world-class universities. Universities are expected to be knowledge-creating institutions.

Knowledge cannot be created in the absence of scholars who are prepared to read, think, reflect and write. The essence of a great university is its ability to influence change through research and the process of the discovery of truth leading to a rigorous analysis that creates knowledge and promotes innovation. This is true in the case of hard sciences, social sciences and humanities. Public policy needs to recognize this aspect of university education for them to develop higher standards in their pursuit of excellence.

A larger question that universities need to address is about the importance of research and scholarship that can generate ideas for change. Research in every discipline, in the arts, humanities, sciences and social sciences, can have a profound impact on our society and beyond. Indifference and complacency to research have led to the inability of universities to produce knowledge that can impact policy, produce innovation or provide solutions to social, economic and political problems that affect nations. Universities ought to become fertile avenues for the generation of ideas through research and publications. Rigorous research in all fields is critical for humanity, as it will be expected to respond to new problems for which old solutions and perspectives may not be helpful. Research produces knowledge that gives clarity based on an informed and deeper understanding of the issues involved.

The focus of world-class universities also needs to be on providing an experience of transnational education to the students. This will expose them to new and emerging frontiers of knowledge and perspectives. It will also introduce them to new cultures and people, and help them to appreciate diversity in an increasingly cosmopolitan and interdependent world. Therefore, universities have to carefully consider their policies for establishing meaningful global collaborations and activities that promote global interaction and provide for a global student experience. We need to innovate on programmes that enable direct interaction between international faculty and students of an institution, and a true collaboration that provides for a rich student experience as opposed to collaborations that remain only on paper. One important area in which global collaboration can revolutionize student experience relates to teaching and learning. Today's technologically advanced world provides scope for innovation in terms of promoting e-learning and virtual global classrooms based on meaningful international collaborations. Such methods can provide students the benefit of interacting with academics and experts from around the world and gain from their knowledge and pedagogical methodology.

There is an urgent need in universities to reflect upon the question of leadership and its efforts to seek reforms relating to institution building. Leadership is central not only for providing an institutional vision that will garner and galvanize academic consciousness among faculty and students to fulfil the goals and aspirations of the university, but also to reflect upon the larger role and responsibilities of the university that connects it with the industry, government, intergovernmental organizations, think tanks and NGOs. Leadership is also about taking responsibility and being accountable for one's decisions.

Our aspiration to establish world-class universities will depend upon our commitment to create and nurture transformational institutions that will inspire the faculty and students with a spirit of enquiry and instil in them the flame of imagination.

Universities and their Role in Promoting Sustainable Futures

Institutions can be developed and nurtured as world-class educational centres only when all the stakeholders of a university — students, faculty, staff, parents, alumni — in addition to relevant government agencies and departments, institutional partners and collaborators, potential donors and partners, local communities and other stakeholders become active participants in its evolution. We need to contemplate how education and institutions of higher learning can create a sustainable future.

Universities are the hub of knowledge-creation and awareness, and provide community-driven, multi-disciplinary approach to problem-solving. Higher

education institutions, in particular, have a central role to play in achieving a new sense of individual consciousness and intellectual orientation towards creating sustainable futures. Universities can be crucial partners in the initiation of dialogue between regional scholars, academics, policy-makers, researchers and relevant state-level agencies.

International collaborations between academics, researchers, global institutions and non-profit foundations engaged in study and practice on related areas, can increase the potential to study previously unexplored approaches, and potential funding sources for research and initiatives related to sustainability. Specific initiatives could take the form of investing in research that is valuable to local communities, and developing research networks with (in) local communities. Relevant disciplinary areas that could lead, and contribute, to such networks include public policy, law, architecture, journalism, management, environmental studies and the liberal arts. Working in collaboration with local governments is another area for greater exploration by universities and institutional leaders.

Interdisciplinary global networks to include institutional, research and collaborative partnerships on exchanging institutional and pedagogical best practices, along with transnational dialogues and forums to deliberate and explore new approaches should also be encouraged.

For universities to play an effective role in advancing sustainable local, national, regional and global development, students must be made active stakeholders in existing and future approaches to sustainability. A primary mode of cultivating sustainability-consciousness is by grounding relevant themes, issues, challenges and concerns within the curricula. A secondary focus area is to orient teachers to design and teach courses more closely aligned with institutional, national and global sustainability agendas.

Providing institutional incentives for researchers working on long-term sustainability research is another way forward. Educational leaders can prioritize research that may contribute directly to sustainable local and national developmental concerns. This can imply incentivizing researchers who choose to work on these areas through greater research support, more institutional funding, adjusting institutional teaching and research responsibilities.

Universities have a greater obligation to accomplish such representation, given the public character of their mission and purpose, and the broad societal goals they commit to achieve. These aims take on greater significance in developing economies like India, given the value that a robust higher education system can add to achieving national developmental goals.

While 21st-century universities must serve as bastions for academic and scholarly work, they must also serve as models of organizational innovation, agility in a complex world, creative negotiation with change, and be representative in demographics, identity and design with local and national communities. These are key elements that will determine the preparedness of universities to contribute to building more sustainable futures.

THE WAY FORWARD FOR UNIVERSITIES TO PROMOTE SOCIAL CHANGE POLICYMAKING

The Global Competitiveness Report 2021 was published by the World Economic Forum (WEF) with a Global Competitiveness Index (GCI). This report assesses the competitiveness of 144 global economies based on 12 points. These include institutions, infrastructure, health and education, labour market efficiency, technological readiness, innovation and business sophistication. A country's global competitiveness is inextricably linked to its ability to formulate and implement sound and effective public policies. Public policymaking is one of the most ignored aspects of governance in many countries. In fact, the widely established practice, unfortunately, is adhocism for governance, with little or no effort to seek empirical analysis in formulating public policy.

While all empirical analyses have their inherent limitations, they are indispensable in weighing different options from the point of view of policy effectiveness. Public policy is critical in every aspect of governance, not least for making laws, rules, regulations, executive orders and administrative directions, and for formulating policies of the government. The purpose of public policy is not only to provide answers to all questions but also to do so by helping the government to ask the right questions in the first place.

Using empirical analysis

In recent times, public policy as a discipline has brought to bear many fields of inquiry to address the central problems of governance. Public policy analysis requires a more rigorous approach in which many fields of inquiry, including, but not limited to, sociology, political science, law, anthropology, ethics and history, besides economics, remain relevant. This kind of analysis and approach to public policy is indispensable for good governance.

There are some pointers in a road map for public policy-based governance. Here are four points, the first being "evaluating policy effectiveness through empirical analysis". It is essential that empirical analysis forms the basis for determining policy effectiveness. For far too long, public policy formulation has been based on anecdotal evidence, perceptions of what might work and

what would not, conventional wisdom of our political and bureaucratic hierarchies, and specious forms of populism. But, as we develop and become a more mature democracy in which reasonable people can disagree as to what is the best way to govern India, there is a need to develop a stronger and more sound empirical basis for policy formulation. Policy formulation should move beyond the whims and fancies of power holders or the good intentions of a few individuals. It should rest upon sound institutional basis in which there is both continuity and change over time. A potential advantage of policy formulation through empirical analysis is that it reduces the risk of dramatic changes in policy due to changes in government after elections.

One of the unfortunate aspects of governance in a number of developing countries is that whenever any new government comes to power, be it at the federal level or at the state level, it spends considerable time undoing many things that the previous government had done. The strange thing in this approach to public policy formulation is that many a time, the same officers who were involved in policy formulation in previous regimes advocating these policies then end up working to justify why these policies are not good. The root of this problem can be traced to the fact that in the first place, these policies were not thought through properly and were not based upon sound empirical foundations to justify their formulation.

Issue of scrutiny

The second is "rigorous legal and constitutional scrutiny before law and policy formulation". The last few decades of governance in India have demonstrated the growing importance of courts and quasi-judicial institutions. Today, more than ever before, every law, policy, rule and regulation formulated by governments and regulatory bodies is being increasingly subject to rigorous legal and constitutional scrutiny. The typical government response has been that this is judicial activism which is hindering the process of executive decision-making and policy formulation.

However, if the executive and the legislature accord more time, thought and reflection before passing laws or making policies, the risk of them being challenged in the courts and the courts declaring them to be in violation of the law or the Constitution, can be considerably reduced. Adhocism, vested interests, biases and prejudices, discrimination and arbitrariness in policy formulation and implementation have made laws and policies more vulnerable to judicial negation. It does not augur well for democratic governance when every decision of the government ends up being challenged in a court of law. The effective functioning of democracies through constitutional governance presupposes a minimal degree of trust among institutions exercising their respective constitutional duties and responsibilities.

Building linkages

The third aspect is in "building linkages among government agencies and academic institutions". Public policy formulation has been an exclusive domain of government departments and agencies. Historically, anybody outside the government giving suggestions to people in government was not only frowned upon but also strongly resisted. Government agencies, including ministries in the Central government and departments in the State government, are woefully preoccupied with a range of day-to-day matters of governance. Their capacity and ability to think and reflect on sound public policymaking is minimal, not because of any inherent limitations of competence, but due to a lack of time and attention, while dealing with the sheer magnitude of bureaucratic procedures of their own making.

Under these circumstances, it can only help the government if it develops strong and substantive linkages with academic institutions, research centres and independent experts. But for these linkages to be effective and meaningful, they should be backed by significant changes in the internal governance structures of government bodies. The advisory role that is hitherto played by people outside the government should give way to a stronger and executive role so that those providing advice feel that their arguments and analysis will be taken seriously and not be set aside after the pretence of consultation leading to an empty exercise in the quest for legitimacy. Public policy should enable people to "speak truth to power".

Establishing Centres

The fourth is in "building public policy schools and research centres". If there is one specific area that is crying out for reform, it is the need to establish several world-class public policy schools. Interdisciplinary studies relating to public policy, both as an academic programme as well as a research programme, leading to cutting-edge, empirical and pioneering research in various fields are absent in most countries of the world. This void is particularly felt in the humanities and social sciences more than in sciences, medicine and engineering. Public policymaking, whether it is about building roads, bridges, airports, seaports, or for that matter, launching rockets and creating nuclear power stations, requires not only well-trained engineers and scientists, but also sociologists, anthropologists, lawyers and, most of all, public policy practitioners who can ensure a consultative dialogue among all stakeholders, including government representatives. The heart of a sound public policy programme lies in the amalgamation of qualitative and quantitative methods for training professionals in public policy; a study of economics and sociology, which is critical to the understanding of social and economic development; law, ethics and governance, which are relevant for examining the institutions that are

responsible for public policy-making and to what extent transparency and accountability inform policymaking.

The future of governance is bound to become more complex leading to disputes and disagreements over different visions of growth and development. In responding to these challenges, the urgent need is for public policy-based analyses in which every stakeholder has a voice and where every voice adds dimension and meaning to the development discourse. The need for ensuring public policy effectiveness is essential to achieve good governance. Otherwise, this goal will remain elusive and our global competitiveness will further decline, as has been the case for many years.

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CHAPTER 11

Universities as Reliable Sources for Public Policy Proposals

Vahan Agopyan & Glauco Arbix

"Sweet are the uses of adversity …" (Shakespeare, *As you like it*)

INTRODUCTION

The plentitude of knowledge set forth by Universities has become increasingly relevant to social life at the present time. Further to the availability of highly qualified professionals and scholars, the pandemic resulting from Covid-19 has shown that governments cooperate at different levels — through science — incorporating rigorous Public Policy criteria. The development of greater cooperation potential, through social integration, shall become paramount to Universities and societies around the globe, for the years to come.

THE THIRD MISSION OF RESEARCH UNIVERSITIES

Universities around the globe have been instrumental in tackling the challenges of the Covid-19 pandemic. From the very beginning, professors, researchers and students alike have engaged themselves to provide reliable information, through the generation of data needed to comprehend the complexity surrounding SARs-COV-2. We have witnessed the onset of networks and joint effort groups, responsible for connecting experts from different fields of knowledge; such action has allowed for regional and global structures to team up and fight the intricacies of the coronavirus, as they are perceived today.

Public health is now at the heart of a global crisis with economic, political and social consequences. Millions of human lives, particularly the most vulnerable, have been affected with harsh consequences for job security and basic survival. It is still too early to track and quantify the outcome of the current situation in all layers of society.

Amidst the shadow of the ongoing pandemic, may it be noted there has rarely been similar times in history when humanity was safeguarded, to such a large extent, by Science. The drive to foster transdisciplinarity and to devise new forms of open-science has helped to advance global cooperation and solidarity.

Researchers have joined efforts with healthcare professionals to enhance and deepen the learning process associated with Covid-19 treatment, producing a great deal of successful results, in spite of lacking or deficient safety gear, tests, antiviral drugs and adequate medical care provided for large segments of the population. Furthermore, this movement has been at the root of clinical testing, vaccine production and distribution; thus, bringing together biology, engineering, health sciences and the humanities, through innovation. Interdisciplinary scientific research has risen to further dimensions of human solidarity, including food collection, the distribution of protective equipment and the dissemination of reliable information, particularly within underprivileged communities, often neglected by the state.

All in all, Universities have been faced by this demising reality with a halt of their day-to-day activities; however, despite a daunting lack of resources, the sense of urgency and social responsibility has prevailed. A great flow of knowledge produced by researchers began to significantly nurture the private sector, the media and government, at all different levels. Due to the relevant data produced by Science, many countries — some exceptions apply — have seen their authorities and policymakers turn their attention and resort to Universities.

The ongoing pandemic has inaugurated an experimental era pertaining to social life around the planet which will remain a mark of this generation for centuries to come. Practically every single organization is now faced with social scrutiny and the need to reevaluate its behaviour, relevance and action. There is a series of expectations stemming from tradition, competence and prompt counter-response to current challenges. The ability to unite all previous traits, to foster and engage in public debate — starting with alternatives for one's own structural readjustment — is of utmost importance.

If Universities can show the ability to advance in their own mission, enlarge their purposes and consolidate their earnest connections and dedication to communities, corporations, governments and society, they may strengthen their authority through increased legitimacy. The post-Covid world, with its unavoidable public fiscal and financial restraints, shall lead

Universities — more than ever — to a fierce competition for already scarce resources. This challenge is particularly relevant for countries struggling with their own internal development, including the case of Brazil, as the countries carry a burden of inequality among their citizens, with limited access to high quality information and education.

In other words, one of the lessons learned from present times is the essential quest unveiled by Universities to increase their sensibility and acceptance towards social needs. For a while, Universities had already started to distance themselves from the ivory towers with elitist thinking, and, now, it is even more relevant to emphasize their connection to society and interdisciplinary action — following a path to understand and mitigate global threats, including biological security and climate change.

The ability to enhance joint action and dialogue with the population as a whole has brought Universities to a new level of social responsibility: a crucial pillar of developed societies. Either through knowledge gathering or scientific rigour, or even through the interaction between empirical and theoretical evaluation criteria, Universities have demonstrated their aptitude to handle the current pandemic hand-in-hand with society, thus contributing to overcoming the most critical challenges of humanity to date.

Further to education and research, Universities have understood that a close relationship with society is vital for their survival and performance. This relationship is to maintain the institutions nearer to public expectations. For the most part, the general public is not aware of what takes place within Universities, nor their role in society. Even though some may assume the general population recognizes what is going on behind the walls of a University campus, this assumption is as far away from reality as it can possibly be.

For this very reason, enhancing the relationship between research Universities and society has been a source of chief concern among University presidents and leaders worldwide, over the past decades. Administrators are responsible to remind the general public, time and again, that research Universities very much contribute to solving social problems on a day-to-day basis. Internationally relevant institutions have a wide-ranging impact that goes beyond their local surroundings, expanding to national levels or even further; the University of São Paulo (USP), for instance, has arisen as a reference in the whole of Brazil and Latin America.

It is important to point out that the so-called *Third Mission* of Universities has been enforced in several developing nations for quite a long time, in many cases since the early decades of the 20th century. This mission is also denominated as "Extension Activities", comprising most of the cultural engagements, health practices, continuing education, open classes, advisory and consultancy activities for the public and governments, community support, art performances, just to mention a few. As a matter of fact, "Extension

Activities" is not exactly what we understand as "Third Mission" nowadays, but they do cover a large number of social and conventional activities leading to their acceptance by society.

LESSONS FROM THE COVID-19 PANDEMIC

The Covid-19 pandemic has been a great distress for the world and for Brazil. Further to the health calamity with a large number of casualties, the second largest in the world to date, Brazil has exposed its levels of social inequality — including limited access to health care, education and working opportunities for the general population. At the same time, society has better realized the importance of knowledge and science to solve its current debacle and has been requesting Universities as a reliable source of information.

Gilles Bibeau, a medical anthropologist at the University of Montreal contends that even if the disease is biological, the epidemic is essentially social. For instance, the city of São Paulo, the largest and the most economically developed in Brazil, confirms this reality on a daily basis. The data indicating death rate, from the beginning of 2021, amounted to an average of 123.2 deaths per 100,000 inhabitants; however, in the richest districts this value drops below 50 and in the more socially deprived areas, it boosts up to almost 200 inhabitants, who are bound to fall victim of the virus. (Ribeiro, 2021).

The pandemic has made the existing social gap in Brazil extremely visible: 20% of the population survives without any public support and do not exist for the welfare system — no housing, formal jobs, education or health care. The present situation is more dire, 2-3% of the population is not even accounted for officially. Furthermore, the fight against spreading the virus has faced a series of difficulties, mainly due to lack of action from the Federal Government. In sum, medical, psychological and social harms continue to grow and affect the most vulnerable.

Inside Universities, the pandemic has accelerated the change of daily activities, which normally would have taken much longer to be absorbed by their respective communities; thus, Covid-19 has been a sort of catalyser for innovation within these institutions. Regarding teaching activities, as a research University, USP has strongly supported — over the years — a close relationship among students and faculty, as its major achievement to foster education in a research environment. The pandemic, however, has help to demonstrate that modern tools have a strong impact on teaching efficiency.

Why not continue to develop and implement new methods and tools for the students in the years to come? For instance, remote classes can help students who may have failed a class, or even have missed some specific sessions. These tools allow students to prepare ahead of time for lectures and to revise the content of a subject matter of their choice. It is clear that USP will not

return to the past. Some students may complain about distance learning and teaching, but now they have also realized how to profit from the new methods. Correspondingly, faculty members have been forced to change the way lectures are prepared, whereas the administration has to provide IT and other infrastructure support for the so-called *new normal*.

Also very significant, it has become evident that internationalization is of utmost importance in order to educate future professionals, making them competent and more competitive to interact with a globalized world. Moreover, for an institution like USP, internationalization is a very efficient tool of quality assurance; an international partnership is a reliable external evaluation source. For this reason, it is essential to keep international cooperation in high consideration, in spite of current restrictions to student and faculty mobility.

Research work is bound to suffer a profound adjustment, as new models arise. Initially, the traditional behaviour of Universities is expected to change. The competitiveness, which was encouraged for internal and external factors, has been transformed due to the urgent need for results demanded by the public. In order to promote a common scientific agenda, it is imperative that collaboration becomes the overarching attitude. Faculties, researchers and students alike have realized the need to share results, as quickly as possible, with other research groups in order to get feedback and provide input for new research. USP, for instance, has been experiencing a new research atmosphere where most of the competitive spirit is turning into collaborative efforts.

However, we have to deal with a significant problem: support for science is not uniform across the world. In some places, many policymakers see science as providing them with political problems, such as balancing public health and the economy. Scientists usually provide them with a myriad of restrictions for public policies, including the use of epidemiological models for public health recommendations. From a narrow-minded viewpoint, policymakers and even some research agencies may have a tendency to support only applied research, with a clear link to improvements to day-to-day life, as commonly perceived.

The oversimplified distinction between science for a purpose (applied) and science for discovery (fundamental) may be actively harming the cause of science, as the separation between these two fields is mostly artificial. The performance of Universities throughout the pandemic provides relevant examples of how closely related both applied and fundamental research can be. The latter has been demonstrated through the development of vaccines in a record short period of time. Applied sciences per se do not create vaccines, as much as the comprehension of the virus structure does not lead to its demise.

The major achievement during this pandemic has been the opportunity to shed light upon the new role of Universities within society. It concerns

not only the excellence of academic activities, but also a rising responsibility to strengthen research fitted to mitigate the devasting effects of Covid-19 worldwide. Such responsibility emphasizes the multiple efforts of academic institutions, including education, research, innovation and engagement with governments and society aiming at the ongoing implementation of avant-garde public policies.

THE ROLE OF THE UNIVERSITY OF SÃO PAULO

It was mid-March 2020, and the University of São Paulo took the extremely difficult decision not to close down the institution. All main activities have been carried out, mostly on a remote basis, strictly following security measures recommended by the local health authorities. More than 90% of teaching activities were held remotely throughout 2020 and remained unchanged during 2021. Fortunately, most faculty and students were prepared and trained to use distance learning tools, and those students who required assistance have received special support. As mentioned previously, both students and faculty now have acquired the taste for using these new devices for their classroom work, which can be very effective. It is important to emphasize that USP believes in the close relationship between faculty and students within a research environment. However, nowadays it is clear to the entire community that onsite classroom activities have a great opportunity for improvement.

Significant changes have also taken place in the realm of research activities. Within a very short period of time, approximately two weeks, almost 250 research groups managed to divert or to start research projects related to Covid-19. They consist of multidisciplinary groups from all areas of knowledge, not only restricted to health sectors. Moreover, they have managed to provide society with proper results in a very short period of time. There has been a change of attitude among researchers, who now understand their ability to generate direct and immediate impact upon society. They have realized the relevance of joint efforts from individuals or groups stemming from different backgrounds, contributing to fulfil the present needs of the population. One can observe this new research behaviour in the laboratories.

Here are some examples: the study of the virus and its alterations through genetic sequencing was vital for the knowledge of virus activity as well as its lab production, providing controlled specimens for research. The action of the virus in human bodies was better understood with autopsies, thus helping physicians to select drugs that are more efficient for their patients. The results of the study of passive immunity — serology — are very encouraging. Also, different research groups are developing vaccines, including one that can be used as a nasal spray. Other teams are performing and developing diagnosis, including rapid tests from saliva and from lung X-ray samples.

Research work has stretched out beyond the health and biological sciences. Engineering research groups have developed different types of equipment, including: low-cost ventilators, masks, face shields, decontamination equipment based on UV radiation, anatomic cushions, telemedicine devices, small robots for hospital use, just to mention a few. Statistics and mathematical modelling of the pandemic performance have been crucial for public policymaking, as well as for the analysis of the available big data, pertaining to the pandemic.

The *Third Mission* of Universities has also been strengthened at USP, for instance through cultural activities where the remote audience is several times larger than the spectators who used to attend such events in the past.

Finally, due to the lack of information and a great deal of so-called fake news, Universities are being seen as a reliable source of information. The number of website visitors has increased five-fold, mainly to access the headline news, and a much larger number of faculty has been invited on a daily basis by the commercial media for interviews and lectures.

UNIVERSITIES AND THEIR CONTRIBUTION TO PUBLIC POLICY

The role of Universities has been neither simple nor harmonious throughout history. The past 50 years have been particularly permeated by instability and the unforeseeable financial resources allocated to academic activities. The existence of constant outside pressure has led Universities to seek more convincing answers to the demands pertaining to admissions criteria, continuing education as well as research and teaching methodology — stemming from governments, legislative bodies, students and teachers alike. Further to the ongoing burden created by the aforementioned demands, over the past years Universities have been faced with disruptive technology anchored upon current digital transformation, shedding light on the urgent need for change.

This novel challenge is not simple. Universities are highly complex institutions, with traditional structures, even though their main focus may be on creating knowledge for the future, through teaching, extension and innovation. They are intertwined with society itself, thus being exposed to prejudice, segregation, poverty and inequality on a daily basis.

The Covid-19 pandemic added up to a new reality in all possible social dimensions; and, in one way or another, it has helped to delineate new paths for the institutional restructuring of Universities worldwide. It is understood that many of the impacts stemming the current pandemic are yet to come; though, one already feels the need to reflect in a more innovative manner — both justly or unjustly. Some fundamental topics for reflection and scrutiny include the proactivity of higher education, evaluation of past results, the

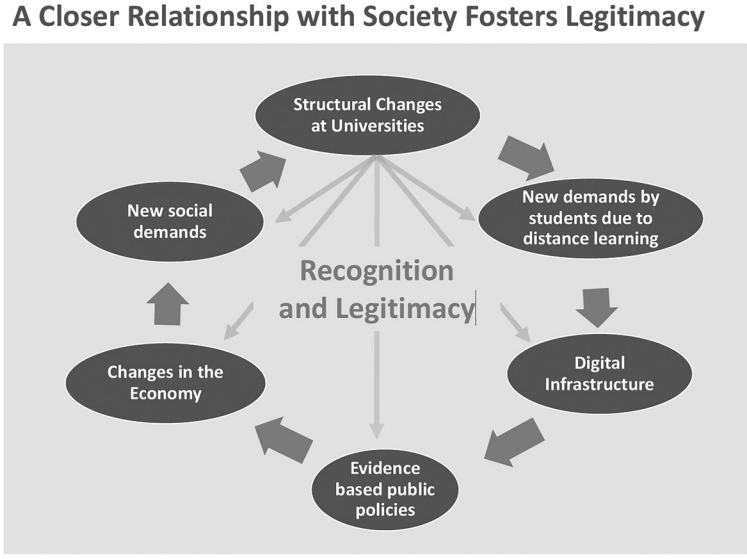
ability to behave as a reliable source of information and the contribution to conceiving public policy, in spite of being faced with the unknown consequences of the post-Covid future.

From a macro viewpoint, the pandemic has contributed to the onset of global unrest and uncertainty, not only from the perspective of a health or biological crisis, but also concerning issues of financial instability and digital transformation — followed by its impact on job creation and on the economy per se. Distance learning is already a reality at Universities today, which can be mirrored upon the future of automation and remote jobs. These developments represent both positive and negative consequences, requiring Universities to carefully redesign teaching, research and extension activities across the board.

The efforts to combat Covid-19 pose a challenge in the way Universities operate today, both from a perspective of their ability to adapt, as well as from feasibility and sustainability viewpoints. How can one teach and research remotely, without the physical presence of professors, students, staff and peer working, all anchored in a long-lasting tradition, and yet continue to worry about the well-being of others? These novel challenges have unveiled social disfunctions which had already been there for quite a long time, as in the case of Brazil. The need for change is clear, though transitional periods create a great degree of uncertainty. There is doubt pertaining to the directions to be taken and with what means — questions that remain to be answered.

The search for a strategy related to hybrid education, both remotely and onsite, adapted to the reality of a specific country, is a relevant issue in our current age. A growing number of initiatives pertaining to distance learning suggest a need for responsible nations and governments not to waste opportunity and talent of their current and future generations. These opportunities may vanish if Universities are not adaptable and up for the current challenge.

As far as public policy is concerned, USP has been downright diligent. Counting on readily available information, data and the production of qualified knowledge — as previously presented — the University was able to position itself as a tool of resilience and was recognized by society for its efforts. USP not only collected relevant public data but also signaled towards the need for transparency, an issue often dismissed by public agencies. There was light shed upon the disengagement of the Brazilian Department of Health and Human Services, and upon the lacking or delayed action of the National Immunization Program, with dire consequences for its population. USP has maintained an ongoing and unwavering dialogue with different governmental and legislative authorities throughout the country, which, in turn, have shown willingness to draft bills and accept suggestions facing up to the crisis at hand.



The aforementioned action has caught the attention of the private sector, society and government authorities, thus creating a great sense of pride within the USP community and its contributors. As a result, USP's network increased significantly through the spread of qualified knowledge. It is still not enough; however, the ongoing initiatives have contributed to consolidating a more rugged institutional position. USP has demonstrated its ability to recommend public policy with evidentiary action, thus opening a window of opportunities for the creation of a dedicated and multidisciplinary Center aligned with social demands and government institutions geared towards education, research and the conception of policymaking.

For many years, USP has offered several courses as well as undergraduate and graduate programmes geared towards Public Policy. Nevertheless, the pandemic has shed light upon the great potential yet to be explored. A novel initiative could integrate researchers from different areas into a dedicated Public Policy Center, apt to train future professionals for the vast job market. This initiative has the potential to provide the public sector with different layers of qualified workforce, allowing people to live in a prosperous environment that is safer, more democratic and with a much lower degree of inequality. Bringing together cutting-edge research and excellence in education — followed by direct interaction among professionals from different areas of knowledge within a newly created institution — would allow USP to significantly contribute to improving the quality of public policymaking throughout the country.

A dedicated group of researchers with an immense amount of knowledge devoted to save lives, in addition to its tradition in education and the ability to evaluate initiatives and policies during the Covid-19 pandemic, all of the above and more has placed USP as a reference hub for the public area.

INTO THE FUTURE

The adversities stemming from the Covid-19 pandemic have helped us understand the relevance of open science, where all types of knowledge can be quickly exchanged and shared, either through data, the publication of scientific articles, workshops, lectures or even distance learning and conferences. This novel approach allows for walls to be torn down, obstacles to be overcome and academic activities to become more intertwined through a multidisciplinary hub, thus fostering scientific progress.

The recent past — comprising an experimental time period at USP — has distinctly shown that scientific research does not always have visible and traceable links to society and its day-to-day needs. Science has a direct effect upon researchers, and equally relevant upon policymakers, health care professionals, patients, families as well as upon the economy, politics and culture.

The experience of opening up for dialogue and contributing to sought-after public initiatives has thrown new light on a well of future possibilities that may generate a positive effect on social life as we know it today. In addition to education, research, extension and innovation, Universities shall become a reliable source of collective policymaking, serving as a platform for public goods, built upon a higher degree of equality for all citizens.

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Chapter 12

The Contribution Of Research-Intensive Universities To The Future Of Progress

Anna Däppen & Michael Schaepman

INTRODUCTION

For many centuries, universities focused on discovering new knowledge "without being subject to any clear quality criteria" (van der Zwaan, 2017, p. 91). In pre-war Europe, the idea that universities might contribute to progress in a more general sense of the term was not prevalent. There were even fears of "over-education" should access to higher education be extended beyond national elites (Valero & Van Reenen, 2018; Goldin & Katz, 2008). Nowadays, it is undisputed that universities make decisive contributions to progress — be it in terms of research, education, general societal development or by boosting economic growth. Recent data show correlations between the number of universities in a country and future growth of GDP per capita (Valero & Van Reenen, 2018). As economic, ecological and social challenges increase, so does public interest in immediate and measurable output of universities. More and more, academia is expected to focus on impact which generates direct benefit for society. Already today, the idea that academic research should serve a purpose is influencing research funding. With the ongoing Covid-19 pandemic and the economic and social crises that are likely to follow, such trends will intensify. Institutions of higher

education have indeed a great capability and also a duty to offer solutions to pressing global problems. Curiosity-driven research and diversity with regard to research topics nurture creativity and innovative spirit — abilities that are indispensable in an ever faster-changing world. The authors therefore believe that solely challenge-driven research — however important it may be — does not represent the most significant contribution of research-intensive universities.

This paper discusses how research-intensive universities contribute to progress today and which framework conditions must be met for universities to successfully contribute to the future of progress.

UNIVERSITIES' CONTRIBUTION TO PROGRESS

"The concept of progress is in fact defined as a motion toward a goal" (Potter, 1962, p. 1). This expression reveals the issue of the current discourse on progress. The term "directional research", as occasionally used by the European Commission, suggests a vector pointing forward — with the term "forward" being intrinsically linked to the notion of progress. More problematic is the fact that the term "directional" is associated to the notion of "serving a purpose", thus de-emphasizing serendipity and value-free basic research. Interestingly, we would not argue alike when looking at art. What progress can be identified when contemporary art is compared to Roman art? Are Roman pieces of art "better" than today's sculptures or paintings? It is argued here that the same is true for progress in research. Undoubtedly, research has made tremendous progress over the past 100 years, in the sense that new methods have been developed and new discoveries been made, such as, for example, in vaccine development or by expanding the standard model in physics, just to name two examples. But this does not mean that science itself is better today than it was 100 years ago. To judge the quality of science by its results alone does not do it justice — there are many more criteria that should be considered as well (e.g. methodological aspects, ethical standards, etc). Increasingly, science is also measured by how successfully it operates at science-policy interfaces. And quite rightly so: without strong science-policy interfaces, many recent key achievements would not have been translated into useful policies, such as the 2° Celsius climate goal or the United Nations Sustainable Development Goals. It is widely accepted that the agreement on the 2°C climate goal represents significant progress. Hence, governments must increasingly interact with science, namely for three reasons: we need science to make sense of the world around us, to guide us and also to find new solutions to the challenges of our time (v. d. Leyen, 2021). Thanks to science, we live better, longer, freer and happier. The reason for this is that we argue

with reason, science, humanism and progress (Pinker, 2018). Accordingly, the future of progress represents a whole series of currents that fight tendencies limiting humanity, such as authoritarianism, ideologism and fatalism. The notion of the future of progress is used here in a context of the necessity to foster value-free, basic research contributing to the continuous evolution of the world towards a better place within new and emerging boundaries of global trends. The future of progress encourages an agenda of scientifically informed criticism, allowing the notion of progress to be decoupled from its traditional meaning of purely economic growth by including degrowth theories (c.f. political ecology, environmental justice, etc.) and other alternatives to be valued as progress, too.

Benefits of value-free research

As mentioned above, it is believed that curiosity-driven, value-free research is of specific importance when promoting the future of progress and innovation in general. According to Benneworth and Cunha, "… the reality of innovation is not a series of smooth loops, but an unpredictable trajectory of experiments, failures, choices and dead-ends …" (Benneworth & Cunha, 2015, p. 11). In short, innovation is rarely a targeted process. Numerous scientific breakthroughs that would later prove decisive for scientific or societal progress came about rather by chance — take, for example, the discovery of penicillin. Therefore, the authors believe that one of the most promising ways in which universities can promote progress and a positive evolution of the world is to promote freedom. That is to say, promote free inquiry, create free spaces for researchers to conduct basic, value-free research and finally foster freedom in academic teaching, too. This last point seems particularly important: in a rapidly changing world and with many countries entering the Fourth Industrial Revolution brought about by technological change, it becomes increasingly difficult to assess today which kinds of knowledge and abilities will be needed tomorrow. Hence, universities should be all the more concerned to remain independent and flexible in their research and funding strategies as well as in scientists' skills. Many companies are currently launching their own apprenticeship programmes so they can "mold" young people to meet their demands. The best examples are Apple University and Singularity University. Research universities, however, should offer courses of studies independent of global or regional trends prone to change. They cannot afford to put their main focus on specific topics that are being considered "fashionable" at the moment, as the hype might be over again soon (M. Schaepman in Furger & Hossli, 2021). Likewise, there might be fields of knowledge that receive little public attention at the moment, but could become more important in the future. In the following, an example of the authors' home institution is cited: since 2013, the University of Zurich (UZH) has been operating a centre of

research on Asian and Oriental studies. The institute brings together Indian, Chinese and Japanese Studies, Islamic Studies and Gender Studies, all of which are small subjects at UZH with modest student numbers. Recently, however, we have noticed a growing interest, especially in Japanese studies. A development that is, amongst other things, attributed by the authors to the increasing importance of Asian countries in a global context.

When discussing the contribution of universities to the future of progress and the role of value-free research, it is also pointed out that of "the myriad ways in which universities contribute to changing the world" (Benneworth *et al.*, 2019), only a small part is directly measurable (e.g. transfer of knowledge and technology into marketable products, number of spin-off companies, generation of economic activity). Apart from that, universities also play an indirect "developmental role" (Gunasekara, 2006, p. 730) for example by providing unbiased analysis or capacity building through academic teaching and by providing access to qualified information via free lectures, panel discussions or museums. Last but not least, the concept of academic freedom itself might promote positive societal development as well. According to Bérubé (2007) and Giroux (2007), universities are fundamental for maintaining democratic societies, as they foster democratic ideals such as free inquiry. Similarly, Tierney and Lechuga assert that "academic freedom has been assumed to be not simply a useful idea for those who work within the academy but for society" (Tierney & Lechuga, 2010, p. 130).

The role of directional (targeted) research

However, it is precisely the independence of universities — and hence, the freedom of research — that is under threat. Mainly because of the increasing pressure universities are exposed to, requiring them to translate research investments directly into benefits. There are several reasons for the growing demand for targeted research. First of all, there seems to be "a growing sense of being at a tipping point, a time of transformation" (European University Association, 2021, p. 4) that is driven by global megatrends affecting all levels of societies worldwide: accelerating technological change and digitalization, rapid evolution of knowledge societies, transformations of the world of work, ongoing processes of globalization and urbanization, emerging markets, ageing societies as well as multiple economic, political and environmental pressures (cf. Dobbs, Manyika, & Woetzel, 2015; Davey, Meerman *et al.*, 2018; European Commission, 2020; European University Association, 2021). Exactly how these trends are affecting research universities will be discussed in more detail later.

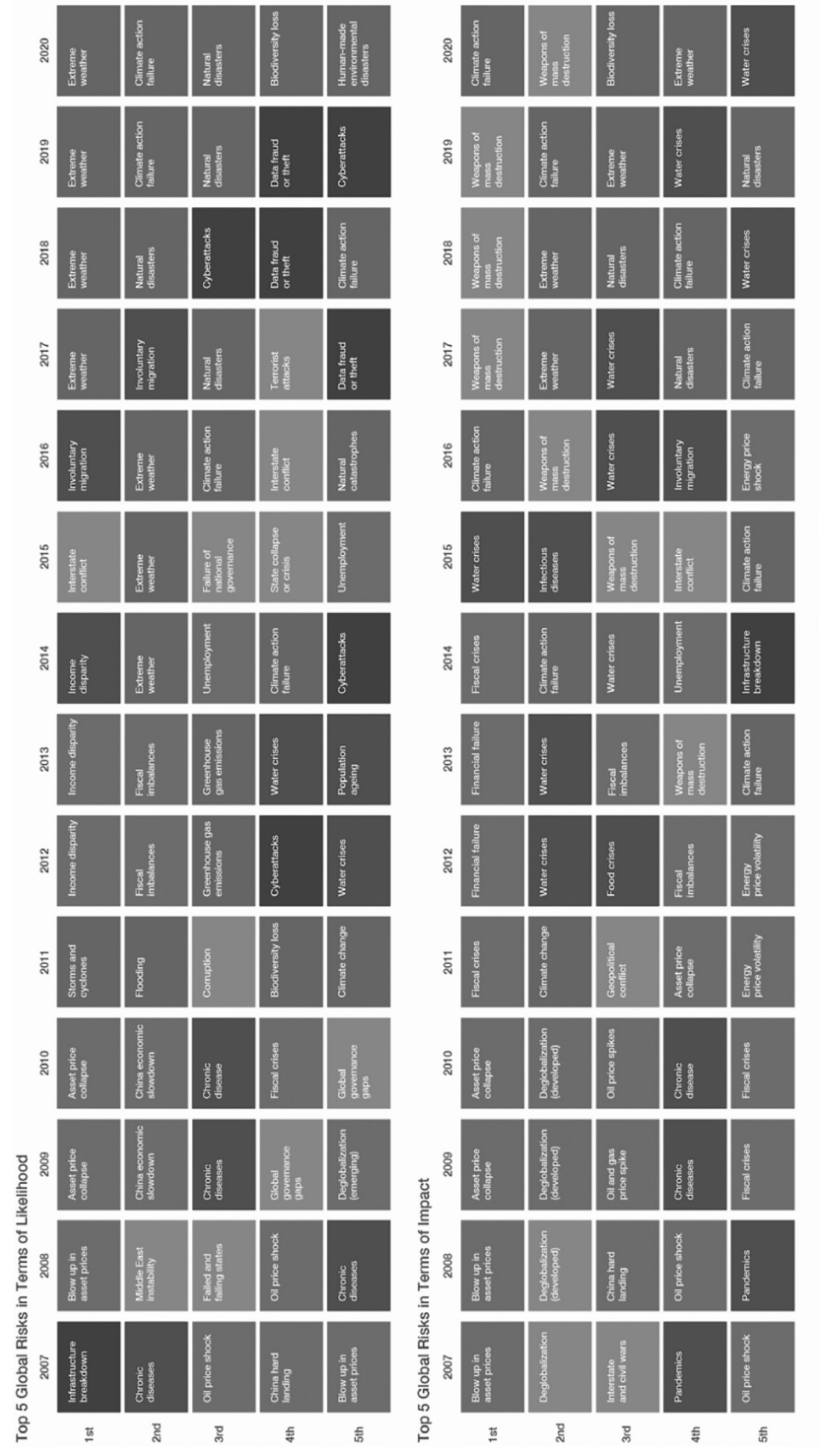
Against the backdrop of global challenges, society's expectations towards universities to fulfil their "third mission" (Etzkowitz & Leydesdorff, 2000,

p. 3, van den Akker & Spaapen, 2017, p. 7) have increased in recent years. More and more, policies are shifting towards the "delivery" (Alexander & Manolchev, 2020, p. 1143) of scholarship and research for societal impact. The point, however, which is made here, is not that targeted research should be rejected in principle. Universities have always been embedded in local societies and interacted with them in various ways. Also, societal interests can provide impetus for research projects that advance science and support progress. At UZH, the need to contain the pandemic and the spread of the Coronavirus have given rise to a large number of new research projects, many of which have already produced significant results. Thus, what is criticized is not directional research per se, but rather the shift from university autonomy towards a culture of efficiency and performance (cf. Alexander & Manolchev, 2020; Ball, 2003) that goes along with the promotion of directional research. This shift is supported not only by the previously mentioned external trends, but also by a range of internal trends shaping the landscapes of higher education.

INTERNAL AND EXTERNAL TRENDS ACTING ON UNIVERSITIES

External trends that affect universities worldwide include global risks, which are predominantly environmental (biodiversity loss, climate change, etc.), technological (disrupting labour markets and changing lives, etc.), geopolitical (democracies under pressure, interstate conflicts, etc.) and societal (disparities, migration, etc.). The top 5 global risks in terms of likelihood and impact have changed from 2007 to 2020 from being economic-dominated to environment-dominated (Figure 1, WEF, Global Risk Report, 2020).

Figure 1


Top 5 Global Risks in Terms of Likelihood
1st
2nd
3rd
4th
5th
2007
Infrastructure breakdown
Chronic diseases
Oil price shock
China hard landing
Blow up in asset prices
2008
Blow up in asset prices
Middle East instability
Failed and failing states
Oil price shock
Chronic diseases
2009
Asset price collapse
China economic slowdown
Chronic diseases
Global governance gaps
Deglobalization (emerging)
2010
Asset price collapse
China economic slowdown
Chronic disease
Fiscal crises
Global governance gaps
2011
Storms and cyclones
Flooding
Corruption
Biodiversity loss
Climate change
2012
Income disparity
Fiscal imbalances
Greenhouse gas emissions
Cyberattacks
Water crises
2013
Income disparity
Fiscal imbalances
Greenhouse gas emissions
Water crises
Population ageing
2014
Income disparity
Extreme weather
Unemployment
Climate action failure
Cyberattacks
2015
Interstate conflict
Extreme weather
Failure of national governance
State collapse or crisis
Unemployment
2016
Involuntary migration
Extreme weather
Climate action failure
Interstate conflict
Natural catastrophes
2017
Extreme weather
Involuntary migration
Natural disasters
Terrorist attacks
Data fraud or theft
2018
Extreme weather
Natural disasters
Cyberattacks
Data fraud or theft
Climate action failure
2019
Extreme weather
Climate action failure
Natural disasters
Data fraud or theft
Cyberattacks
2020
Extreme weather
Climate action failure
Natural disasters
Biodiversity loss
Human-made environmental disasters
Top 5 Global Risks in Terms of Impact
1st
2nd
3rd
4th
5th
2007
Blow up in asset prices
Deglobalization
Interstate and civil wars
Pandemics
Oil price shock
2008
Blow up in asset prices
Deglobalization (developed)
China hard landing
Oil price shock
Pandemics
2009
Asset price collapse
Deglobalization (developed)
Oil and gas price spike
Chronic diseases
Fiscal crises
2010
Asset price collapse
Deglobalization (developed)
Oil price spikes
Chronic disease
Fiscal crises
2011
Fiscal crises
Climate change
Geopolitical conflict
Asset price collapse
Energy price volatility
2012
Financial failure
Water crises
Food crises
Fiscal imbalances
Energy price volatility
2013
Financial failure
Water crises
Fiscal imbalances
Weapons of mass destruction
Climate action failure
2014
Fiscal crises
Climate action failure
Water crises
Unemployment
Infrastructure breakdown
2015
Water crises
Infectious diseases
Weapons of mass destruction
Interstate conflict
Climate action failure
2016
Climate action failure
Weapons of mass destruction
Water crises
Involuntary migration
Energy price shock
2017
Weapons of mass destruction
Extreme weather
Water crises
Natural disasters
Climate action failure
2018
Weapons of mass destruction
Extreme weather
Natural disasters
Climate action failure
Water crises
2019
Weapons of mass destruction
Climate action failure
Extreme weather
Water crises
Natural disasters
2020
Climate action failure
Weapons of mass destruction
Biodiversity loss
Extreme weather
Water crises
Economic
Environmental
Geopolitical
Societal
Technological

At the same time, the predominantly dual role of universities in higher education and research is itself increasingly developing to be a geopolitical factor, too.

Internal trends affecting universities include expectations towards universities to provide answers to pressing questions more rapidly and in a more targeted fashion. Keywords often mentioned in this context are agility, directionality and translational research. The European Research Area (ERA) constitutes of a 14-point action plan (DG Research and Innovation, 2020), that is based on excellence and competition, as well as on talent-driven and open research. Key to ERA are ideas such as "developing industrial technology roadmaps to maximize innovation in strategic areas" (Action 5), "strengthening excellence and maximizing the value of knowledge generation, circulation and use" (Action 6), as well as "developing guiding principles for creating value from knowledge" (Action 7), reconfirming the need of "directional research". An emphasis on the need for independent, value-free fundamental research is not expressed anywhere. In other words, the majority of trends that can currently be observed indicate that universities are primarily requested to provide more value for the (predominantly) governmental investments. Both inside and outside universities, the focus of decision-makers is on efficiency and efficacy. And since most universities nowadays face an underfunding challenge — as research grows much faster than financial support to universities — they need to be as efficient as commercial market players. The third space, increasingly occupying professional roles in general management, specialist areas or quasi-academic areas at universities (Gordon & Withchurch, 2007), will have to overcome the prevailing simple dichotomy of administrative versus academic staff (Rhoades 1998). Skill sets of future labour workers are composed of all relevant skills necessary to perform basic research (such as analytical thinking and innovation, active learning strategies, complex problem-solving, creativity, originality and initiative, etc. (WEF, 2020, p. 163).

What is more, universities are nowadays required to provide synthesized findings that are understandable for a broad, non-academic public and written in a "marketable" form. In Switzerland, discussions about "optimized" science-policy interfaces have intensified recently in the context of the Coronavirus pandemic. In spring 2020, the Swiss government set up a scientific Covid-19 task force in order to support political decision-making processes, including lockdown policy, by scientific evidence. The role of the scientific task force, however, repeatedly gave rise to debates. There were voices criticizing the cautionary tone of the task force, while the scientific experts themselves complained about not being listened to enough. The example of the task force is a good illustration of the conflicts that are likely to arise when "usability demands" are made on basic research. Tensions became particularly evident when the nearly real-time development of a

vaccine against Covid-19 simultaneously gave rise to requirements for synthesis findings based on clinical trials of new vaccines to be made available in real time, too.

NEW UNIVERSITY MODELS

In view of the many external and internal pressures affecting universities, several new university models of how to make universities fit for the future have been proposed recently.

In their "thoughtbook" on the future of universities, which was funded by the European Commission, Davey, Meerman *et al.* set out to create a vision for the university in 2040. They do so by giving the views of various academics, entrepreneurs and thought leaders in 40 individual articles. While not proposing a clear-cut university model, the majority of voices speaking in the "thoughtbook" place a strong focus on the need of universities to become more engaged and entrepreneurial if they wish to thrive in an uncertain future. The authors agree in principle that universities will continue to play an important role as providers of "discipline-knowledge" (Davey, Meerman *et al.*, 2018, p. 11), especially in light of the increasing importance of lifelong learning. But the way in which universities will perform this task will change significantly. According to van Damme (2018), for instance, universities should adapt their teaching by focusing more on skills that are relevant in the labour market. In the view of several authors, universities should also strive to adopt new learning and teaching methods to allow for more flexible, cooperative, interdisciplinary learning (cf. Dolderer, 2018; Godsman, 2018; Coley, 2018), also by making use of new technologies in order to reach more students (Davey, Meerman *et al.*, 2018). Another point which is highlighted by several contributors is the importance of co-creation of knowledge and value-co-creation between stakeholders from academia, business and society at large (cf. Bregenholt, 2018; Plewa *et al.*, 2018; Abruzzini, 2018). As the editors put it, the authors collectively "envisage a close integration of university and business, founded in a clear understanding of the economic and social benefit such a collaboration can achieve". (Davey, Meerman *et al.*, 2018, p. 15). To sum up, according to the "thoughtbook", universities that wish to play a significant role as drivers of positive change in the future must align with business innovation and transform into spaces where academics work in "symbiotic partnerships with industry, government and societal stakeholders" (Davey, Meerman *et al.*, 2018, p. 6).

In a similar direction points the "Blueprint for Universities of the Future" proposed by a Knowledge Alliance Project also supported by the European Commission. The report provides recommendations "on how to solve the educational challenges around Industry 4.0" (Universities of the Future, 2019,

p. 3). According to the authors, Industry 4.0 will mainly require "transferable skills" (Universities of the Future, p. 8) that can be applied in changing settings and across disciplinary borders. To ensure that employees can keep their skills up to date in a constantly changing world, the "Blueprint" sees it as one of the main roles of universities in the future to provide educational programmes that ensure a skilled workforce. In order to make sure that education is aligned to the needs of industry and society, universities should act as "platforms" or "bridge builders" (Universities of the Future, 2019, p. 12) that foster the relations between higher education, industry and the public sector. The authors emphasize that "developing closer collaboration between Institutions of Higher Education and industry is for mutual benefit" (Universities of the Future, 2019, p. 12).

Cooperation between academic and non-academic partners plays an important role also in the vision of universities without walls, which was proposed very recently by the European University Association (EUA) in 2021. The paper aims at providing European universities with a model of how they should aspire to develop during the next decade. Looking to the future, the authors envision "universities without walls" (European University Association, 2021, p. 5) assuming a leading role within society, both as drivers of societal change and as centres of research, where knowledge is built, developed and shared within national or international networks. Again, the function of universities as bridge builders and co-creators of knowledge is highlighted. However, the role of universities without walls is not that of institutions reduced to "knowledge providers" delivering specific services. Rather, they retain the traditional core missions of universities (teaching, research, innovation and contributions to culture), but strengthen their transformative capacities by becoming more open and engaged. By open universities, the authors understand institutions that are connected with partners from inside and outside academia, as well as accessible to students and staff from diverse backgrounds. This includes, for instance, providing a physical campus, but also a virtual one. The term engaged universities describes institutions that put their skills and knowledge into the service of society, in particular by tackling global challenges such as sustainability, social cohesion and the promotion of diversity. But targeted research is not presented as the only way to fulfil this mission. Rather, the authors emphasize that value-free research will be of essential importance for universities in the future: "… curiosity-driven research will be a precondition for knowledge-based solutions, it will also be fully recognized as an end in itself. Universities will provide space for lateral thinkers who test and develop new ideas that are not yet acknowledged …" (European University Association, 2021, p. 8).

In order to turn their vision of universities without walls into reality, the authors identify three decisive factors: enabling frameworks, in particular the

protection of university autonomy, adequate (more) investments and strong leadership. Additionally, three more priorities are mentioned, which must be considered for a successful implementation of the universities without walls model. According to the authors, their vision requires a reform of academic careers (more flexible, less precarious, new evaluation practices), more interdisciplinary approaches and finally more measures on the part of universities to promote social engagement.

CONCLUSIONS

While excellent universities are both responding to changes in trends and actively contributing to trend-setting, their resilience is dependent on the amount of basic research performed. Research-intensive universities contribute to progress by shaping the future of research, teaching, innovation and culture. A strongly diversified portfolio of research activities, substantial research-intensive and moderate directional research, constitutes the best strategy to build resilience and reinsurance for future trends. The future of progress is strongly dependent on diverse, interdisciplinary and basic research activities of universities.

Key framework conditions for sustainable university models are:

- sufficiently high fraction of available basic research funding for interdisciplinary topics,
- skill set of teachers and students aiming at new academic and economic labour market requirements (such as empathy, emotional intelligence, etc.),
- creative, original and critical thinking for innovative approaches and ideas, as well as
- leadership and social influence to establish a culture of openness, sharing attitude, and resilience.

It is up to the universities to take up those challenges and ensure with their strategy that their research strategies are not outpaced by an accelerated (external) change of trends, regionally, nationally and globally.

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Chapter 13

'Density and diplomas': how universities can overcome the great divide and rebuild trust in science

Meric S. Gertler

INTRODUCTION

It is widely reported that the rise of populist movements has fueled an increasing distrust towards science, threatening the relationship between universities and their host societies, including governments, financial supporters and the general public. Evidence is readily at hand. A headline in the Pew Charitable Trusts February 2021 edition of *Trend* reads: "Why We Must Rebuild Trust in Science" (Parikh, 2021). An article in *C&EN* (Chemical and Engineering News) from January 2021 warned that the "confluence of rapidly evolving science, mixed messaging, misinformation, and flagrant politicization in the U.S. is creating a perfect storm for eroding trust in science" (Cross, 2021). An editorial in the *New York Times* told readers "When You Can't Just 'Trust the Science'" (Douthat, 2020). A paper in the *Journal of Public Economics* argued that "Public trust in scientists and vaccines is likely to be damaged by COVID-19" (Eichengreen *et al.*, 2021).

However, conflicting evidence is also readily at hand. The most recent Wellcome Global Monitor survey, widely cited, found that nearly three-quarters of the world's population (72%) trust scientists (Gallup, 2019). The 2021 3M State of Science Index Survey found global "science skepticism" at

its lowest point since they began tracking it, down eight percentage points to 27% from a pre-pandemic level of 35% in 2020. Polling conducted by Research!America, a science advocacy alliance, showed robust support for science and research institutions in the United States, with 46% of respondents reporting that their trust in science had increased over the past year (America Speaks!, 2021). A prominent piece in the September 2020 issue of *Wired* announced "No, Public Trust in Scientific Institutions Has Not Eroded" (Engber, 2020).

Even allowing for the usual practice of exaggerating headlines, these competing views of the state of trust in science seem difficult to reconcile. Is trust in science eroding or strengthening? Has the pandemic damaged trust in science or enhanced it? The answer, I will argue, is more nuanced than a binary "yes" or "no", and depends on the context and constituency. Trust in science — and in higher education, research and expertise more generally — differs across political, socio-economic and even geographic divides.

In this chapter, I will examine some of the forces that seem to enhance or diminish trust in science (and support for universities) and suggest how these patterns of variation might highlight a strategy for resolution, one in which universities play a large part in addressing the root causes of distrust where it exists. The clearly established link between "density" (urban regions) and "diplomas" (propensity to be highly educated) provides an important clue in this regard (Krugman, 2020). But first, I will consider briefly why trust in science and expertise matters.

WHY IT MATTERS

Why is it important for society to have trust in science and expertise? One simple answer is that our lives and well-being may depend on it. Drawing on vaccination programmes as an example, Sturgis *et al*. (2021) eloquently capture a key thought:

> As in other contexts where science and technology intersect with daily lives, most citizens do not have the time, expertise or inclination to assess for themselves the risks and hazards arising from mass inoculation programmes. For this reason, trust in the technical competence and social responsibility of scientific experts is a crucial (if implicit) underpinning for citizen and societal decision-making on vaccination. Trust in science and scientists thus serves as an efficient heuristic shortcut to determining an appropriate judgement about the safety, effectiveness and importance of vaccination that would otherwise require costly and error-prone cognitive processing for individuals.

This reasoning is compelling — and salient in the present circumstances. Mass inoculation programmes are under way in countries around the world.

Their success, and with it the prospect of finally emerging from the tragic grip of the pandemic, will require populations to "trust in the technical competence and social responsibility of scientific experts". Conversely, distrust in scientific experts will impede those programmes and cause illness, death and suffering. This same reasoning applies, mutatis mutandis, to the challenges we face from climate change, water and food security, poverty and social polarization, systemic racism and the many other complex and increasingly urgent challenges confronting our species. Trust in science and expertise will be of the utmost importance in responding to these impending or present crises.

Moreover, broad societal trust in science is a prerequisite for government funding of research and advanced education — the core business of universities. Societal trust in science and expertise is thus an essential component in enabling scientists and other experts to understand the crises we face in the first instance, and then to discover, innovate and create solutions to those crises. Implementing those solutions, as in a programme of mass vaccination, is a subsidiary process. It is little good having a broad consensus on the value of a vaccine and trust in its effectiveness if we don't understand the physiology of the virus and haven't discovered a vaccine, along with other complementary factors, from the vectors of transmission to the public health dynamics of achieving herd immunity. Indeed, without societal trust, we are unlikely to discover solutions to hugely complex problems in the first place.

These two senses of trust in science, individual and societal, are mutually reinforcing. Societal trust fosters individual trust. Sturgis *et al.* (2021) again:

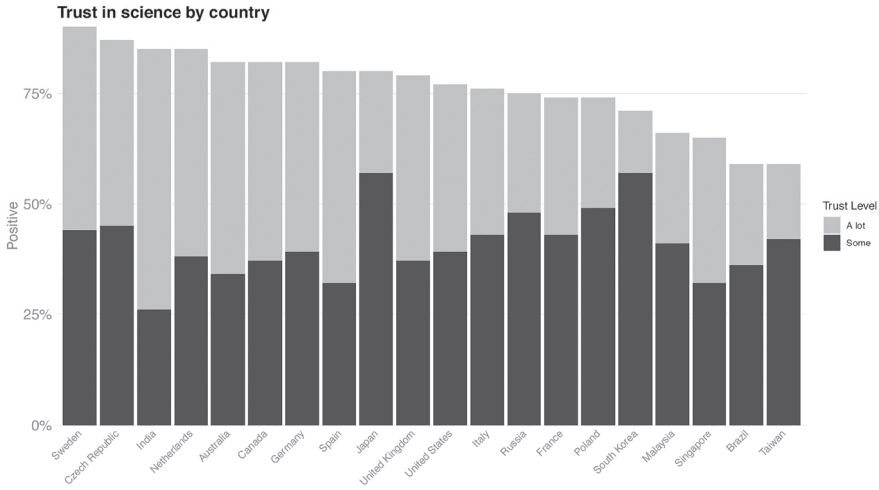
> In short, instead of costly information processing, people rely on heuristics about the trustworthiness of science, and this tendency is likely to be more pronounced when there is a strong societal consensus about the value, utility and safety of science and technology.

HOW PREVALENT IS (DIS)TRUST IN SCIENCE? WHO (DIS)TRUSTS IT MOST?

Having established that trust in science (and expertise more generally) has important implications for individual and societal well-being, as well as for the strength of support for universities, the question of its status among the public has renewed urgency. Is trust in science eroding? As I suggested at the outset, the answer to this question differs across cultural, socio-economic and geographic boundaries. Examining the available data supports this argument — and, I will suggest, points to the role universities can play in addressing the root causes of distrust where it exists.

In the aggregate, trust in science appears to be robust. The Pew Research Center International Science Survey 2019-2020 found strong majorities of respondents around the world indicating that they had "a lot" or "some" trust in scientists to do what is right for the public. The median values, measured across all responding countries, showed more than a third of respondents had "a lot" of trust and three-quarters had "a lot" or "some" trust (Funk *et al.*, 2020).

Figure 1 shows that the results of the survey vary considerably by country, though mostly within the proportions claiming "a lot" or "some" trust. In India, for example, 59% of respondents had "a lot" of trust in scientists to do what is right for the public and 26% had "some". In Canada those numbers were, respectively, 45% and 37%. In the United States they were 38% and 39%. In Japan 23% and 57%.

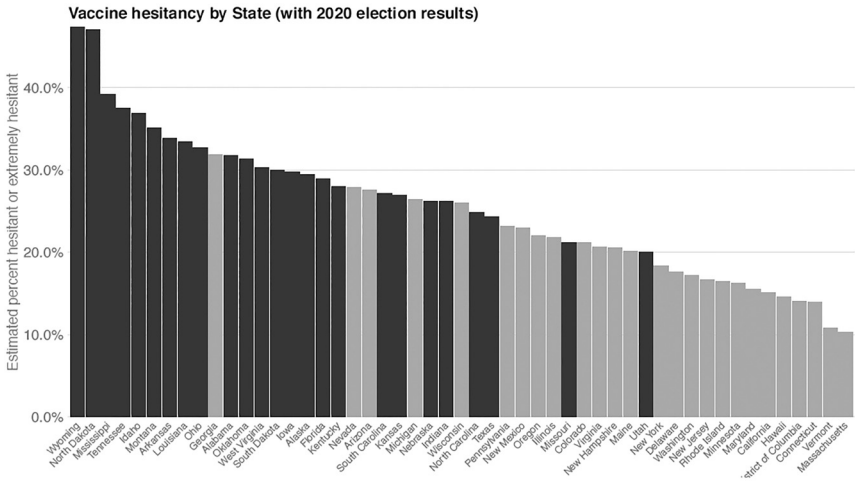


Notwithstanding this overall finding, notable differences begin to emerge when we disaggregate the analysis by political orientation. The same Pew survey found that political ideology had a significant impact on trust in scientists to do the right thing for society, with often large variances between left-leaning and right-leaning political affiliations. In Canada, for example, 74% of respondents identifying as left-leaning have "a lot" of trust in scientists to do what is right for the public, versus only 35% of respondents identifying as right-leaning. This was generally the pattern across most of the countries surveyed; trust in science was higher on the left of the political spectrum than on the right. Nowhere was this contrast more pronounced than in the United States. Along with greater skepticism in general, the gap between political ideologies is the largest of any country included in the Pew study: 62% of left-leaning respondents trust scientists "a lot" against only 20% of

right-leaning respondents. And this gap has widened during the pandemic as each side has become further entrenched in their respective political encampments (Funk & Tyson, 2020b).

Indeed, the pandemic has provided unique conditions in which to examine these issues, since (as suggested by Sturgis *et al.)* levels of trust in science might well shape individual attitudes towards vaccination.

Figure 2 provides another perspective on this issue by examining the relationship between vaccine hesitancy and political orientation. It shows state-level estimates of vaccine hesitancy from the CDC based on recent federal survey data (Household Pulse Survey, 14-26 April, 2021). States in which a majority of voters supported the Republican candidate in the 2020 presidential election are shaded dark grey. States in which a majority of voters opted for the Democratic candidate are light grey. With very few exceptions, states with the highest vaccine hesitancy rates (and, implicitly, distrust in science) were states that voted Republican (U.S. Census Bureau, 2021a).



As the immunization programme rolled out in the United States, data on actual vaccination rates — rather than survey results tracking vaccine hesitancy — became available. One might reasonably imagine that, as the toll of the pandemic became increasingly clear and news of the success of the vaccination programme spread, those expressing hesitancy about vaccination might become more trusting. Based on the most recent data, this does not appear to be the case. There is a strong and significant negative correlation ($R^2 = 0.56$, $p < .001$) between the share of a state's electorate that voted Republican in 2020 and the share of that state's 18+ population with at least one dose of a vaccine for COVID-19. (Data sourced from Centers for Disease Control and Prevention, 2021a).

To be sure, there are many intervening variables that may help explain the likelihood of vaccination, including gender, age, class and education levels, distance to a vaccination site, precarity of employment and, not least, race — see, for example, Leonhardt (2021) and KFF (2021). Race is an especially worrying complication in light of the well-documented distrust towards various levels of government in many Black and African American communities — especially given the horrors of the Tuskegee Study. Nevertheless, according to the results of a March 2021 NPR/PBS NewsHour/Marist Poll, COVID-19 vaccine hesitancy among self-identifying Black respondents was no stronger than among self-identifying White respondents (Summers, 2021).

County-level data are even more striking. Excluding Texas (which, at the time of writing, reported only at the state level), there are 2,179 counties in the United States in which more than 25% of the resident population 18 years of age or older reported being "hesitant or strongly hesitant" to receive a COVID-19 vaccine; 1,958 of those counties — 90% – voted Republican in 2020. Of the 71 counties in the United States in which fewer than 15% of the resident population 18 years of age or older reported being "hesitant or strongly hesitant" to receive a COVID-19 vaccine, only 7 voted Republican in 2020. (Data soured from Centers for Disease Control and Prevention, 2021b.)

To summarize, using vaccine hesitancy or actual vaccination rates as a proxy for societal trust in science, there is evidence that distrust of science is not universal, but is most pronounced amongst those leaning to the right on the political spectrum.

It is important to note here that this finding is strongly consistent with U.S. public opinion polling on support for universities and research institutions, which similarly finds the strongest support amongst Democrats and the weakest support amongst Republicans. (See for example, Auter, 2017, and Fingerhut, 2017). For example, periodic polling performed for the Association of American Universities (AAU) has consistently indicated that those respondents identifying as Democrats are far more likely to endorse the view that "America's leading research universities are generally going in the right direction" versus being "off on the wrong track". By contrast, Republican respondents are far more likely to express the latter opinion. Moreover, the views of Democrats and Republicans on this question have become significantly more polarized since the start of the COVID-19 pandemic, with the gap now reaching all-time highs.

What theories might one advance to explain these patterns, and what implications might they hold for how we might enhance trust in those communities where science distrust or scepticism is most pronounced?

EVIDENCE FROM THE GEOGRAPHY OF HIGHER EDUCATION

A starting point for this discussion comes from the increasingly stark geography of educational attainment within countries like the United States, in which the likelihood of having completed a university degree programme is considerably higher for those living in major metropolitan areas. As Nobel laureate Paul Krugman has recently noted:

> In practice, density and diplomas tend to go together — an association that has grown stronger over the past few decades. Modern economic growth has been led by knowledge-based industries; these industries tend to concentrate in large metropolitan areas that have highly educated work forces; and the growth of these metropolitan areas brings in even more highly educated workers. (Krugman, 2020)

Citing Thompson (2020), Krugman observes that "the great divide in American politics is now over 'density and diplomas': highly urbanized states — especially those containing large metropolitan areas — with highly educated populations tend to be Democratic." Indeed, "density" was Thompson's compelling shorthand for urban regions that Democrats won by large margins. But his wider point was about "[t]he polarization of place". This polarization of place closely reflects the polarization of trust.

These observations suggest that geographic context plays a pivotal role in shaping one's political identity and, hence, one's degree of trust in science and support for universities — an hypothesis worth considering more closely.

Indeed, when one examines the geographic distribution of U.S. institutions of higher education and advanced research, the patterns are striking (see Figure 3). If we look at where degree-granting institutions in the United States are located, we find that they are found in counties that supported Biden over Trump in the 2020 election by a margin of roughly 1.8 to 1. Furthermore, the more selective an institution is — or the more an institution is likely to be perceived as "elite" — the less likely it is to be situated in a county that voted for Donald Trump in 2020. Indeed, of the 63 U.S. universities in the AAU, the most prestigious club of universities, only one is located in a county that voted Republican in the 2020 election, and even then, it was extremely close: Stony Brook, New York, voted Republican by 282 votes.

If knowing someone who attends or works at an elite research-intensive university is one means of building trust in science and support for higher education, then communities that do not host such institutions are much less likely to be home to those who trust science. Distrust in science may find a fertile home in such communities of scepticism.

But perhaps this analysis overstates the importance of local geography. Even if a community does not physically contain an elite research-intensive university, perhaps it still sends students to such universities and welcomes alumni back home? Might this be another route to building social acceptance for elite institutions?

Students from states that voted Democrat in the 2020 Presidential election attend AAU universities at two and a half times the rate of students from Republican states. There is a strong and significant negative correlation (rho = -0.58, $p < .001$) between living in a Republican state and attending an AAU university. And when you consider just AAU private institutions, the correlation is even more pronounced (rho = -0.74, $0 < .001$).

Distribution of higher education institutions by counties won by each candidate in 2020 Presidential election

	Degree-granting institutions	Degree granting, 4+ year institutions	Degree granting, 4+ year, institutions with Doctoral research degrees	AAU institutions
Trump	1515	935	195	1
Biden	2701	1906	621	62

To give one example: Harvard's 2018 freshman class contained a total of eight students from seven Republican states: Alabama, Idaho, Kansas, Montana, North Dakota, Oklahoma and Wyoming. The same class included 42 students from Democratic Illinois, a state with 30% fewer college-age students (1,070,400) than the seven Republican states combined (1,378,900). Other AAU private universities show similarly skewed geographic patterns of intake (National Center for Education Statistics, 2021).

This analysis is far from conclusive in determining causality. Nevertheless, two facts clearly emerge: first, comparatively few elite universities are located in those communities that are most deeply distrustful of science and higher education; and second, those "communities of scepticism" send disproportionately fewer students to elite universities, wherever they may be located.

As a consequence, the institutions that so often educate the experts interviewed in newspapers, on TV or online are remote, unfamiliar and seemingly inaccessible to the very members of society being asked to trust them. Add to this the fact that the Union of Concerned Scientists (2021) tracked over 150 "attacks on science" coming from the Trump administration and the 115th Congress, and conditions in these communities were ripe for distrust.

A PROPOSAL TO 'REBUILD' TRUST IN SCIENCE

If the preceding analysis is correct, then this suggests two important steps universities could take in rebuilding trust in science — and support for higher education — where it is most depleted. First, national and subnational governments should invest in the quality of universities located in communities in which distrust of science and advanced education is most pronounced. And second, a nation's most selective universities should focus more purposefully on ensuring access for students from the widest range of socioeconomic and geographic backgrounds. I will address each proposal in turn.

Invest

The data in Figure 3 suggest an important opportunity. Governments should consider investing in — or upgrading the capacity of — universities in communities in which distrust of science and advanced education is high. Such institutions could promote science education and research, not only by showing why science matters, but by teaching how science is done and why we should trust it. By engaging directly with those in surrounding communities, universities can build the social acceptance upon which trust in science depends.

While there are more than three times as many degree-granting, 4+ year institutions with doctoral research degrees in counties that voted Democrat in the 2020 election than voted Republican, the distribution is considerably more even for less elite institutions. There are some 933 degree-granting, 4+ year institutions in counties that voted Republican in 2020, and more than 700 of these do not have doctoral research programmes already. Why couldn't several of those be enhanced, expanded or enriched?

In addition, many elite universities have invested in overseas campuses in recent years. According to the Cross-Border Education Research Team, there are 86 international campuses of U.S. institutions (Kinser & Lane, 2020). Carnegie Mellon operates campuses in Qatar, Australia and Rwanda. NYU has campuses in China, United Arab Emirates and India. Northwestern University is in Qatar. This invites an obvious question: if CMU can open a campus in Rwanda, why not Nebraska?

This idea is not as facetious as it might appear. In a recent piece in the *New York Times* called "Why Stanford should clone itself", David Kirp of the University of California, Berkeley, argued "If elite colleges are serious about diversity of class and race, there's a simple solution" (Kirp, 2021). I would add "enhancing trust in science" to "diversity of class and race". Would a CMU-Omaha reduce vaccine hesitancy rates and increase trust in science in Nebraska? I suspect it would significantly increase participation in higher-education and advanced research in Nebraska. In 2018, a total of 90 students

from Nebraska enrolled as freshmen in private AAU universities (including one at CMU). That represents a rate of 5 per 100,000 college-age residents. By contrast, Massachusetts sent 2,562 students to private AAU universities (including 64 to CMU) — a rate of 44 per 100,000 college age residents, nearly 10 times higher than Nebraska's rate (National Center for Education Statistics, 2021; United States Census Bureau, 2021b). Yes, proximity plays a role: there are three AAU private institutions in Massachusetts. But that is exactly the point. CMU-Omaha would be local.

In a recent article in the *Washington Post*, Jeffrey Selingo criticized elite private U.S. universities for failing to enrol a greater number of students, despite their large endowments and deep pockets (Selingo, 2021). The author argues that Harvard's tiny acceptance rate of 3.4%, the lowest in the institution's history, along with similar figures for Yale, Princeton, Brown and many other elite universities, are signs of "institutional failure". According to Selingo, these institutions should expand: there is no shortage of qualified students and it would be an opportunity to enrol greater numbers of lower-income and underrepresented students. Opening a campus in Nebraska, for example, would also accomplish this goal — with the additional benefits proximity to an elite research-intensive university would bestow.

It is important that individuals in communities of scepticism and distrust regard attending university as a possibility for their children (or themselves). Knowing someone who attends — or better yet, having a child who attends — an elite research-intensive university is a powerful means of building social acceptance for science and advanced education within a community. Likewise, working at, or knowing someone who works at, such an institution is likely to have a similar effect. Having an elite research-intensive university in the same state or in a nearby county would help create that social acceptance, along with the first-order opportunities and benefits that flow from expanding access to university education.

Access and recruitment

My second proposal is more modest, and hardly novel. And yet, if it is true that lack of access to top universities is one of the factors engendering distrust in science — and support for universities themselves — then it is time to redouble our efforts to change this. Simply put, a nation's most selective institutions should focus more purposefully on ensuring access for qualified students from the widest range of socioeconomic and geographic backgrounds.

Attention in recent years has focused in many jurisdictions on broadening socioeconomic participation, understood broadly to include economic, racial, cultural and other factors (see for example, Gertler, 2018). While this is positive and vitally important, results have been mixed. A 2017 study found

38 universities in the United States that enrolled more students from the top 1% of the national income distribution than the lowest 60%. In the United Kingdom, Russell Group universities have been criticized for failing to admit a greater number of the most disadvantaged students. As in the U.S., efforts at reform have met with mixed success. According to the most recent data, Oxford, Cambridge, UCL, King's College and Queen Mary University of London all admitted fewer than 3.5% of their students from those neighbourhoods that traditionally have sent the fewest students to university (HESA, 2021).

There are many explanations for these results. But one that is often advanced — that universities cannot find qualified students from these communities — is evidence of more institutional failure. The students are there. We are just not recruiting them. The National Education Equity Lab, a U.S. non-profit, organized a pilot programme in the fall of 2019 to test how high school students from underprivileged communities might fare in a first-year Harvard course. The Lab enrolled 343 students from high-priority communities across the U.S. The course was developed and taught by a Harvard faculty member: 277 completed the course; 89% passed and earned college credit; 63% received an A or a B grade (National Education Equity Lab, 2021). As the Equity Lab puts it, "Talent is evenly distributed, opportunity is not."

My proposal is to distribute opportunity better. Institutions of higher education and advanced research should reinvent their recruitment efforts, seeking out talented students where they live. One of the students who completed the Equity Lab programme from her home in Gallup, New Mexico (vaccine hesitancy rate "hesitant or strongly": 41%), captured the essence of the challenge: "Harvard isn't part of the conversation — you don't even hear that word in Gallup" (Green, 2021).

The cost — or perceived cost — of attending an elite institution is one of the biggest hurdles to recruiting students from underprivileged or geographically skeptical areas. Unsurprisingly, "affordability" is the top concern identified by parents and students in multiple surveys (Princeton Review, 2021). In communities of scepticism and distrust, the same scepticism and distrust that dominate local perceptions also amplify the concern over affordability ("why pay all of that money for something of questionable value?") Clearly, more work is required to overcome these challenges.

But it is not just about how much it costs to go to university or how much institutions spend on student aid. We have to engage with communities directly on why an education matters, how it helps enrich life, and how the scholarship produced by universities helps societies tackle their most pressing problems. This kind of engagement has to start early. It is something that universities — perhaps in a collective effort — must help primary and secondary schools with. It is a critically important form of outreach and, ultimately,

recruitment. It is also an essential part of rebuilding trust in science in those communities where it is low.

CONCLUSION

If we are to address the root causes of distrust in science, expertise and higher education within communities of scepticism, we must build broader social acceptance of higher education and advanced research by enhancing access within those communities. This means bridging gaps of political ideology and geography — and overcoming the "density and diplomas" nexus. It means seeking out those communities to engage with them directly. This is one role universities can play to overcome the great divide and rebuild trust in science.

Ultimately, this kind of engagement will benefit everyone. As we work to solve the urgent and complex crises on the horizon — pandemics, climate change, food security, poverty or mass migration of refugees — more widespread trust in science will provide a stronger base of support for the mission of higher education and research. The two notions go hand in hand.

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PART IV

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Universities as the Fifth Power?

CHAPTER 14

Advances in Science Diplomacy: Showcasing New Multidisciplinary Approaches

Joël Mesot

On 10 January 2020, a momentous phone call took place between two scientists, Edward Holmes and Yong-Zhen Zhang. Holmes reached Zhang on a plane and asked permission to publish the DNA of SARS-Cov-2, which Zhang had decoded shortly before in his lab at Fudan University in Shanghai. Zhang agreed (Gill, 2021). A few hours later, the genetic code of the new virus that would keep the world on tenterhooks for more than a year was available for download on a server.

That phone call is emblematic for the role of science in the biggest pandemic in more than 100 years. Edward Holmes, a virologist at the University of Sydney, and his Chinese colleague Zhang had known each other for years and conducted research together in the field of dangerous viruses. With the publication of the genetic material, they gave the decisive starting signal for an unprecedented race of science in the fight against the Corona virus. On 10 January 2020, about two weeks before WHO even issued a warning of a public health emergency of international concern. Zhang and Holmes made this move together and at a time when the governments of their two countries were lobbing accusations at each other.

A VIRUS THAT CHANGED EVERYTHING

The two virologists knew exactly that no time was to be wasted. Laboratories around the world immediately began analysing the virus and developing a vaccine, including researchers from Pfizer/BionTech and Moderna, who would be among the first to develop an effective vaccine on the basis of the mRNA technology. Less than a year after the virus's blueprint was published, dozens of vaccines were ready to be applied, a tremendous achievement by researchers from universities and industry. The intensity of collaboration across national borders is evidenced by the more than 170,000 hits that a search of the National Library of Medicine's (2021) PubMed database yields or by initiatives such as Covid-19 Host Genetics Initiative, in which researchers from the U.S., Europe and Asia collaborate.

However, with the development and approval of vaccines, the problem was not solved. The distribution of vaccines posed further challenges and revealed how difficult it is to reconcile national interests and the claim for a fair distribution. Not surprisingly, a distribution battle soon ensued over the approved vaccines, with wealthy countries securing the necessary supplies through direct contracts with pharmaceutical companies to vaccinate their own populations. As of mid-January 2021, high-income countries, who represent only 16% of the world's population, held 60% of the vaccines for Covid-19 (Marcus, 2021). Multilateral initiatives such as the WHO's Covax platform continue to call for a more equitable distribution of vaccines but have little to counter the market logic of *first come first served*. Several countries such as China, Russia and India have found ways to take advantage of the situation. They have supplied a number of countries with their vaccines in an attempt to expand their geopolitical influence. China had already provided personnel and medical equipment to hard-hit countries like Italy at the beginning of the pandemic. The linking of pandemic aid with foreign policy goals led to the neologism of vaccination diplomacy.

The pandemic acts both as an accelerator and a magnifying glass. Developments that under normal circumstances risk being delayed are triggered because the pressure becomes great enough for change. Management of the health crises has revealed strengths and weaknesses in all countries. Strengths such as solidarity practised in large parts of society and the professional ethics of health care personnel in the most difficult moments of pandemic. But there is also a number of deficits that can be identified in retrospect:

- We have to admit that in many ways we were under-prepared for the pandemic, even though regional viral diseases had repeatedly emerged over the past 20 years and there was no lack of voices from the scientific community and the media warning of the danger of a pandemic (Henig, 2020).

- Globalization has pushed the international division of labour to new heights but we have long ignored the rising vulnerability of our economies in the process. The disruption of entire supply chains and the acute shortage of ventilators and consumables such as masks forces us to address economic dependencies.
- Quick reaction by authorities is critical in the fight against the virus. Digital technologies can help collect and analyse relevant data on the virus. However, the pandemic has exposed major gaps in this regard. We need to strengthen digital literacy and speed up the digital transformation at all levels of our administration.
- The drastic measures taken by governments to contain the spread of the virus have met more and more resistance over the course of the pandemic. While debate is part of the democratic process, the crisis has also given rise to conspiracy theories and the spread of fake news. Science needs to address this problem.
- The crisis turned out to be a learning experience for the scientists as well. They first had to find the right balance between their mandate as experts and members of national science task forces and their role of independent researchers.

The health crisis catapulted science into the public spotlight and turned many researchers into sought-after experts overnight. Government agencies based their decisions on recommendations from scientific task forces. In Switzerland, too, scientists made their expertise available in the Swiss National Covid-19 Science Task Force. For all parties involved — politicians, public health authorities and scientists — it was a new experience that triggered some heated discussion about the roles of experts and policy advisors. The dialogue between science and policy may not be an easy one, yet there is no way around it. What we need is to create a basis of trust in the light of our experiences in order to avoid frictional losses in a next crisis. The value of cooperation was also demonstrated in the development of the SwissCovid app (2020) within a couple of months by researchers from EPFL and ETH Zurich. This non-trivial task was only possible thanks to long-term investments in informatics and well-established scientific networks.

With the inoculation programmes worldwide under way, there are justified hopes that the pandemic can be largely contained in 2021. But we are aware that the status quo ante will not return and the virus most likely will stay. Furthermore, the world community faces more challenges: Climate change, biodiversity loss, resources depletion, food security, wealth inequality, migration and political extremism, to name just the most important of the known ones, urge us to act. While scientific progress and technological innovation alone cannot solve the problems, a more sustainable and climate-friendly world is not conceivable without science and education.

AN ALLIANCE OF GOOD WILL

We live in a time when more people are dedicated to science than ever before. New research findings have the potential to improve diagnostic and therapeutic procedures in the fight against diseases by orders of magnitude. They can make our healthcare systems more efficient. The ever-expanding internet transcends national borders and brings education to the far corners of the world. The engineering of new materials and green technologies are enabling us to decarbonize our economies and balance growth and prosperity with our planet's finite resources.

On the other hand, every technical advance also carries with it the risk of misuse. Digital technologies in particular are intruding into people's lives as never before and are also causing fears. Fears that one's own work could be rationalized away by advances in robotics and artificial intelligence, fears also that the state will use technology to increasingly monitor citizens and restrict their individual rights. Not to mention the threats posed by cyberspace, which is increasingly becoming the locus of organized crime and state aggression.

We need to take these concerns seriously. Science must incorporate privacy issues and ethical considerations into its activities right from the outset. Against this backdrop, ETH Zurich opened its AI Center in 2020 with the explicit mission to build AI systems that are trustworthy, accessible and inclusive.

Transformative technologies such as 5G, CRISPR-Cas or even AI call for a democratic debate to find viable solutions and achieve social acceptance. For an informed discussion to take place, we need the expertise of all scientific disciplines and a commitment to interdisciplinary cooperation spanning from the humanities and social sciences to natural sciences and engineering.

Science is thus part of an alliance of goodwill that includes all sectors of society and aims at technological progress for the benefit of mankind and the preservation of our natural livelihood. The global dimension of the issues and the need to negotiate solutions in the political sphere make a merger of scientific and diplomatic expertise a logical next step.

THREE LEVELS OF SCIENCE DIPLOMACY

Science diplomacy in the broad sense of an interaction between the world of science and diplomacy in the service of foreign policy goals is not new. History provides several examples from earlier eras such as the colonization of Africa in the 19th century (Gamito-Marquez, 2020). More recently, the topic has attracted increased attention. As a case in point, the American Association for the Advancement of Science (AAAS) has been operating a Center for Science Diplomacy since 2008. The Center aims to promote interaction

between the two spheres and to strengthen the role of science in foreign policy. The European Union funded three initiatives under the Horizon 2020 programme that led to the creation of the EU Science Diplomacy Alliance (2021).

These developments are reflected in a growing demand for education and training opportunities to create a common understanding of the two worlds that share a common interest, but act too often in silos. However, university courses are still highly fragmented and a "structured foundational course addressing the commonalities of all the scientific and technological issues relevant to international affairs is still lacking", note Jean-Christoph Mauduit and Marga Gual Soler in their paper (2020).

When it comes to defining the term, reference is often made to a report published by AAAS/Royal Society (2010). Science diplomacy thus combines various activities at the interface of science and foreign policy:

- *Science in Diplomacy*: the direct provision of advice to diplomacy by science; a prominent example is the Intergovernmental Panel on Climate Change (IPCC), established in 1988 to provide policy-makers with the latest knowledge on climate change and its consequences. Another example is the Land Transport Agreement between Switzerland and the E.U. (Bilateral I) and the Schengen Association Agreement negotiations (Bilateral II) in which mathematical optimization resp. game theory contributed to the successful conclusion.
- *Science for Diplomacy*: the use of science and research to achieve diplomatic goals that can help improve international relations where traditional foreign policy tools have been exhausted. Arctic research and space cooperation as exemplified in operation of the International Space Station (ISS) showcase the soft power of science.
- *Diplomacy for Science*: enabling transnational scientific cooperation by means of diplomacy; the founding of CERN in Geneva in 1954 can serve as an example of this or the synchrotron light source SESAME in Jordan that was developed under the auspices of UNESCO and officially opened in 2017.

In practice, the goals and means of science diplomacy become intermingled and the three levels can no longer be strictly distinguished which makes "the concept of SD a moving target, a concept with loose boundaries that is increasingly used as a catch-all concept in different fields", as Elisabeth Epping (2020, p. 2) critically remarks.

FROM SWITZERLAND'S FIRST SCIENCE COUNCILLOR…

From a Swiss perspective, science diplomacy can be traced back to the 1950s and is actually linked to ETH Zurich. In 1958, ETH graduate Urs Hochstrasser became Switzerland's first science councillor. Although Hochstrasser was employed under private law, he was assigned to the Swiss Embassy in Washington. As a physicist with a doctorate, he was tasked on the one hand with monitoring and reporting on technological developments in the U.S., especially in the field of nuclear technology, the hot topic of that time. On the other hand, he was to support efforts to motivate Swiss specialists to return to Switzerland after studying in the U.S. (Keller, 2017). In 1955, the Swiss ambassador Henry de Torrenté had campaigned for this post in a letter to Federal Councillor Max Petitpierre (Fleury *et al.*, 2004).

With the creation of a science council, Switzerland took a step that comparable countries such as Austria, Belgium or the Netherlands had taken earlier. Over the years, other science councils were to be added in strategic regions of the world, until Switzerland took on a pioneering role in the late 1990s and early 2000s with the establishment of a swissnex (2021) network. The first two outposts were established in Boston and San Francisco against the backdrop of the incipient Internet revolution, but also the internationalization of higher education and research and the increasing global competition for talent.

…TO ITS FIRST REPRESENTATIVE FOR SCIENCE DIPLOMACY

The swissnex outposts deliberately left the traditional paths of science diplomacy and tried out new forms of cooperation and mediation between science, technology and culture. Today, swissnex consists of five locations — Boston, San Francisco, Shanghai, Bangalore and Rio de Janeiro. The network is operated as a private-public partnership under the direction of the Federal Department of Foreign Affairs (FDFA) and the State Secretariat for Education, Research and Innovation (SERI).

The most recent chapter has been opened by the Federal Council in the context of its current *Foreign Policy Strategy* 2020-23 (2020) where the Swiss government commits itself to strengthening science diplomacy and international Geneva to become the place where states, companies and representatives from civil society debate rules and guard rails for human-centred digitalization. The appointment of Switzerland's first special representative for science diplomacy, Ambassador Alexander Fasel, in 2021, underlines this

political ambition. To complement the picture of recent Swiss initiatives, the Geneva Science and Diplomacy Anticipator (GESDA) will be discussed next.

ANTICIPATE — ACCELERATE — TRANSLATE

How can scientific findings and breakthroughs be identified at an early stage and applied as quickly as possible to solve global problems? This question is the starting point of the GESDA initiative, launched in 2019 with the support of the Swiss government and the canton and city of Geneva. Under its umbrella, GESDA intends to bring experts from academia, diplomacy, industry and civil society together to develop new solutions and ensure their implementation. As a part of the methodological toolbox, the Geneva initiative comes up with technology assessments of what might be technologically possible in three different time horizons (5, 10 or 25 years). They all revolve around three fundamental questions: 1) What defines us as humans, in contrast to robots and cyborgs? 2) How can we create just and inclusive societies? And 3) How can humanity develop without destroying the environment so that future generations will also have a perspective worth living for?

The scientific interests are clustered in four platforms: Quantum Revolution and Advanced Intelligence, Human Augmentation, Eco-regeneration and Geoengineering, and Science and Diplomacy. The GESDA* aims to be both a think tank and a do tank.

TECHNOLOGY AT THE SERVICE OF HUMANITARIAN WORK

ETH Zurich has created several education and training programmes and launched collaborative projects at the interface of science and diplomacy in recent years. In 2020, when a worldwide shortage of ventilators became apparent during the Corona crisis, several engineering researchers initiated a project together with medical doctors from Zurich University Hospital to develop a low-cost, easy-to-use ventilator. The device is meant to provide temporary relief to patients with respiratory problems in hospitals or in ambulances of low and middle-income countries. The “breathe” (2021) project, created in the context of the pandemic and supported by the FDFA, has led to a fully functioning prototype and will be followed up beyond the Corona crisis.

Humanitarian and development organizations are seeking cooperation with universities. Technological progress offers opportunities to increase the impact of their work and to make more effective use of the donations they receive. On the other hand, the challenges of organizations such as the International Committee of the Red Cross (ICRC) in the field are huge. The

two Federal Institutes of Technology ETH Zurich and EPFL have therefore joined forces with the ICRC in 2020 to launch the Engineering Humanitarian Aid initiative with the aim of making knowledge and technologies in the fields of energy and the environment, data science and digital technology, and personalized medicine available where they are most urgently needed: in humanitarian crises.

The jointly defined projects tackle challenges ICRC delegates are confronted with in their field work: One project relates to the difficulties in assessing accurately and in real time how many people need help and when and where. Another project tackles the question of a fair and equitable distribution of aid supplies. While there is no doubt about the relevance of such cooperation, previous experiences have also revealed certain risks in collaborative projects between universities and NGOs. For example, unaddressed questions of funding or diverging expectations can represent stumbling blocks between the partners. It is therefore important that needs, responsibilities and milestones are clarified before starting a collaboration (Schönenberger *et al.*, 2021).

FROM THEORY TO PRACTICE AND BACK

In 2020, ETH Zurich entered into a partnership with Ashesi University in Ghana. Together with Swiss industry partners, the two academic institutions have developed a master programme in engineering that is aimed at promoting the next generation of leaders in sub-Saharan Africa. The programme will be taught in tandem between faculty from ETH and Ashesi University. Thanks to the involvement of industry partners, the curriculum addresses local market needs and provides graduates with an entrepreneurial perspective.

In 2013, Michael Ambühl, a top diplomat of many years' standing, returned to his alma mater to take up a new ETH chair of negotiation and conflict management. In his role of Switzerland's chief negotiator, Ambühl was instrumental to the conclusion of the Bilateral Agreements II between the E.U. and Switzerland and served the Swiss Confederation as State Secretary until his return to ETH. Having studied applied mathematics and having served as a professional diplomat with 30 years' experience, he had developed a methodology of quantitative negotiation strategy termed "Negotiation Engineering", which he could now pass on to engineers and natural science students.

Computer modeling and other quantitative methods are also of use in conflict resolution, as the work of political scientist Lars-Erik Cederman demonstrates. In his research on the causes of ethnic conflict and nationalism (Cederman, 2021), he could empirically demonstrate that regional autonomy for ethnic minorities and their involvement in political decisions, as well as balanced distribution of wealth, are crucial to achieving lasting peace.

Both Ambühl and Cederman are involved in ETH Zurich's continuing education offerings at the interface of science and diplomacy. While the MAS in Peace Processes provides participants with the necessary knowledge, skills and techniques to mediate violent political conflicts, two CAS, one in policy and advocacy and one in governance and administration, prepare participants to manage complex governance projects within a competitive international context.

BOLSTERING THE GENEVA — ZURICH AXIS

The preceding sections should provide enough arguments for a stronger linkage between the various actors. Despite the wealth of initiatives and activities, Switzerland has so far lacked a broad university education and systematic research approach on the relevant topics at the interface with science diplomacy. The University of Geneva and ETH Zurich are therefore in the process of establishing a joint Lab for Science in Diplomacy, based on two pillars: a professorship in Computational Diplomacy (University of Geneva) and a professorship in Negotiation Engineering (ETH).

This Center will strengthen the Geneva-Zurich axis and create synergies between two complementary competence profiles. However, it should be open to collaboration with other partners from academia and practice. We are convinced that by joining forces in this way, we can meet a growing need and contribute to the education and training of a new generation of diplomats with an affinity for science and of scientists with a strong sense for international relations. The Center sees itself as part of the network of governmental and non-governmental actors that rely on the powerful combination of science and international cooperation to solve urgent problems.

SOME FINAL THOUGHTS

The global nature of the challenges such as climate change, nutrition, cybersecurity, gene editing technologies, etc. requires international cooperation. The complexity of these challenges cannot be mastered without scientific expertise and technological innovation. To find sustainable and socially acceptable solutions there is no other way than to include all relevant forces in society. Diplomacy builds bridges between states and within multilateral forums. Science too relies in its quest for truth on openness and exchanges beyond national boundaries. Science and diplomacy thus prove to be two ideal allies for a world in line with the SDGs and the Agenda 2030 of the U.N.

On the other hand, they represent two worlds with distinct cultures and traditions. There are differences between the two spheres. Just as it is often necessary to find a common language between various scientific disciplines,

this also applies to the cooperation between science and diplomacy. A fruitful "cohabitation" requires a convergence of the two cultures and a mutual understanding of the other's way of thinking. Scientists need to be familiar with the intricacies of international relations just as diplomats need to be familiar with how scientific research works. The various initiatives that have come to life over the past years reflect the increased interest in a closer cooperation between the two fields. Important steps have been made. Further efforts by politics, universities and academies in education, training and research are still needed to form science and diplomacy into a powerful couple. Recent developments inspire confidence that this can succeed.

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Chapter 15

Research Universities and the Power of Resilience During a Pandemic

Tony F. Chan & David E. Keyes

INTRODUCTION

Universities, particularly research universities, are seats of soft power, possessing the ability to co-opt rather than to coerce (Nye, 1990 & 2004). This power derives in large measure from their resilience; universities are intellectual stem cells that can reinvent themselves to respond to crises, while simultaneously possessing longevity that surpasses most institutions of government or commerce. For example, the Universities of Bologna and Oxford are 933 and 925 years old, respectively, whereas the longest-lived nation-states based on the dates of their current constitutional documents are San Marino and the United States of America at 421 and 243 years, respectively.

Strong universities are sources of soft power for their host countries that, through their discovery, innovation, training and reputation, also stand directly behind much of the hard power that their host countries possess. Cultivating such soft power should be a conscious undercurrent in university strategic planning. In a virtuous cycle, universities gain the support and trust that promote their autonomy by consciously reinvesting a portion of that gain to engage with and enrich their societies — the successful "fifth power" is rarely an ivory tower. In this article, we explore these themes in the context of a purpose-built science and technology research university facing the defining event of its young life, namely the Covid-19 pandemic.

The Covid-19 pandemic has provided unusual visibility into a feature of research universities that often goes unseen, though it is always latent and often exercised outside public view: their ability to pivot rapidly to address crises or to capitalize on opportunities. Across the globe in early 2020, university researchers appreciated the potential severity of the SARS-CoV-2 virus before most others who were in a position to act. Within days of this realization, they reconfigured their laboratories, hopped onto their supercomputers or into the cloud, and devoured online archives and databases to refocus their capabilities on urgent emerging targets.

Mathematicians and statisticians modelled the spread of infections, retracing the very origins of their modern disciplines in the smallpox modelling of Daniel Bernoulli (Bernoulli, 1766). He was an early advocate of rooting public health policy in science, stating: "I simply wish that, in a matter which so closely concerns the well-being of the human race, no decision shall be made without all the knowledge that a little analysis and calculation can provide."

Simultaneously, mechanical engineers studied the fluid dynamics of sneezing and passive aerosol transport in ventilated rooms and moving vehicles. Biochemists employed molecular dynamics simulations to study the docking mechanism of the SARS-CoV-2 spike protein. Machine learners built automated medical imaging systems that proved more accurate than radiologists in diagnosing early onset of the disease in lungs and sentiment detection systems that scoured social media posts for clues of incipient outbreaks. Genomicists and physiologists looked for existing certified pharmaceuticals to repurpose for therapies. With haste, scientists from many disciplines began work on novel antigen and antibody tests that would provide data to policymakers and allow pinpointing infected individuals in order to relieve regional economies of blanket lockdowns. Water quality engineers devised effluent tests to localize outbreaks at a coarser and more convenient grain than individual testing. In addition, with unprecedented urgency due to the unavoidable latency of clinical tests, campaigns were launched globally to produce the first round of vaccines, many of them in universities.

The broad multidisciplinarity of this effort is impressive, but there is, in fact, a long tradition of academic researchers rallying to respond to human-caused and natural disasters, world-round and year-round. Most such academic campaigns are narrower in disciplinary scope or address issues that are geographically or demographically less universal than the campaign to understand and mitigate Covid-19, but universities are on the front lines of human resilience in the face of adversarial circumstances all the time.

MULTIPLE TIMESCALES AND PLURIPOTENCY OF UNIVERSITIES

It is notable that universities, renowned for possessing the longest timescales among human institutions, can react on the shortest of timescales; however, this should come as no surprise. Universities are multi-purpose institutions. Besides curating established knowledge, testing and refining candidate new knowledge, and training emerging members of the creative class, under the right leadership universities are also capable of being mobilized for rapid responses to social needs. The same top-level expertise and facilities required to train the next generation in steady state are deployable on short notice to address crises. However, a university is not a collection of specialized SWAT teams, like fire departments or National Guard units, with their highly intermittent duty cycles. A university is a vibrant organism with a perpetual duty cycle, efficient in time-sharing among its many services to society and able to boost priorities of one or another function to respond to need.

Moreover, research universities do not go through boom and bust cycles like corporations that specialize in a particular technology that may become obsolete. Universities evolve smoothly to remain relevant to their evolving societies through the "invisible hand" of scientific opportunity and the continual adaptations of individual investigators. Of course, enlightened leadership is required to incentivize this adaptation rather than to stultify it, so that, underneath a seal and a motto that persist for centuries, a university reinvents itself year after year. Universities cycle doctoral and post-doctoral workers through their short training cycles. On a somewhat longer scale, they initiate and sunset research centres in a semi-Darwinian manner, primarily according to social need as reflected in the availability of competitively awarded external funding. Meanwhile, they host expertise in academic departments that evolve on still longer scales and provide homes over the lifetimes of most faculty members. Ideally, not only are the walls between departments highly permeable, but the walls of the universities themselves. In a type of intellectual breathing, students pursue internships in industry and national laboratories, while faculty consult and undertake sabbaticals to both spread their knowledge and bring fresh perspectives back to their research programmes. University researchers are also incentivized to create start-up companies and to perform terms of service in professional societies and government agencies.

If such a versatile organism for intellectual, social and economic advancement had not evolved on its own from ancient roots in libraries and monasteries under royal or ecclesiastical patronage, it would have to be invented… or, in the case of the King Abdullah University of Science and Technology (KAUST), reinvented. KAUST, founded in 2009 to focus on sustainable technologies, was conceived of by its founder as a

reinvention of the Bayt al Hikmah, or "House of Wisdom" of the Islamic Golden Age, in Baghdad, which from the 9th to the 13th century welcomed knowledge-seekers of all origins and cultures, and is noted especially for its advances in mathematics, chemistry, astronomy, medicine and cryptography during the "Dark Ages".

King Abdullah bin Abdulaziz al Saud (1924—2015) began planning for an eponymous research university founded on principles of intellectual freedom, merit-based promotion and non-discrimination at the outset of his reign (2005—2015) and chartered it on 11 December 2006. Exactly 1,000 days later, on 5 September 2009, more than 400 graduate students from more than 60 countries began classes in a newly constructed campus under 70 charter faculty. On Saudi National Day, 23 September 2009, approximately 1,000 international dignitaries, from heads of state to Nobel Prize winners, from university presidents to heads of international science agencies, participated in opening ceremonies and a day-long symposium entitled Sustainability in a Changing Climate, with foci on energy, environment, food and water.

KAUST DURING THE PANDEMIC ('R3T')

KAUST was among the numerous institutions that adapted to fight the pandemic on the front lines of science. Three days after Saudi Arabia closed its skies to international traffic and began to lock down, one of us invoked the example of young Isaac Newton's invention of much of calculus, optics and gravitation during his *annus mirabilis* of 1665-1667, when he was forced to vacate his studies at the Cambridge because of the Bubonic Plague, to rally the faculty.

Together with Vice President for Research Donal Bradley and Dean of Biological and Environmental Sciences and Engineering Pierre Magistretti, we formed a Rapid Research Response Team (R3T; see http://kaust.edu.sa/en/r3t-covid-19) focusing on a wide variety of aspects of Covid-19 mitigation and prevention. Simultaneously, we began a series of public lectures to engender an appreciation of the unseen enemy and promote a science-based behavioural shift of the KAUST community and those in the country beyond. We also opened a reserved allocation on KAUST's supercomputer to pandemic fighters, joining the leading supercomputing countries in this endeavour.

Inspiration: Newton and the Bubonic Plague

Because KAUST's response to the COVID-19 pandemic has significantly transformed its relationship to Saudi Arabia, we reproduce here our charge to the community:

March 19, 2020
Dear KAUST Faculty,

With the rapidly developing Covid-19 crisis, this must be a stressful time for all of us. But I'd like to suggest that we turn this curse into an opportunity. I strongly believe that science will have to, and can, play a key role for humanity to tackle Covid-19.
So, while we are struggling to keep our family and KAUST safe by changing our lifestyle and work habits, let's not forget that, as a university of science and technology, we also have an opportunity, even an obligation, to try to make our contributions to tackle this global crisis.
I am reminded of the legend of Isaac Newton discovering the law of gravity and the theories of optics, and developed calculus, while he was "home quarantined" during the Bubonic Plague! That should serve as an inspiration for all of us!
I encourage you to dig deep into your area of scientific expertise and make use of the next few weeks (months?) to find opportunities to come up with knowledge, tools, solutions, mitigation, even cures for the virus, and any harm that it has caused humanity.
Feel free to involve your students, postdocs and research staff in this. If there is any help that I and my office can do to help facilitate and support your endeavour, please don't hesitate to let me know.
On a related front, Vice President [for Innovation and Economic Development] Kevin Cullen and I are working together to formulate a Covid-19 Innovation Challenge that will involve the whole KAUST community.

Stay tuned!
Your president,
Tony

Among the most notable translational fruits of the resulting R3T campaign are: (1) a highly reagent-efficient one-step RT-PCR test that has already gained the approval of the Saudi Ministry of Health (MoH) for clinical diagnosis, (2) an RT-PCR test that simultaneously identifies mutations in five different regions of the coronavirus genome for tracking the spread of variants, (3) a nano transistor-based diagnostic kit capable of detecting very low levels of viral mRNA and protein, whose MoH approval is in progress, (4) a vaccine for a fast and long-lasting immune response that is a mix of viral mRNA and proteins being developed with TIBA Biotech of Boston, and (5) an AI-based lung imaging test portable across CT-scan vendors that is now employed in clinical practice in Saudi hospitals. Moreover, the KAUST Core Laboratories partnered with a major national industrial firm (the Al Olayan Group) to produce an AMBU-bag based ventilator and 3D-printed face shields.

A wide range of publications appeared quickly on open servers and have made their way into refereed journals. The visibility KAUST gained in national public health and health care circles contributed impetus to the launch in March 2021 of KAUST's Smart Health Initiative, in partnership with the Ministry of Health and many Saudi hospitals, which will include an MD-PhD programme and a new Master's programme in Medical Technology.

Gratifyingly, the faculty responded to the challenge and referred to the R3T manifesto throughout the pandemic pause. One of them, Professor Mo Li, when his work in multi-variant detection garnered *New York Times* coverage on 14 April 2021, told us:

> I must thank you for your call for rapid research response in the early days of the pandemic. I remember vividly your example of Isaac Newton, which motivated me to use the crisis as an opportunity to do something useful. I am truly fortunate to work under the visionary leadership of you, Prof. Bradley and Pierre and to collaborate with many great scientists in the R3T team.

By demonstrating resilience, our young university not only gained tremendous self-confidence, but the university's image was nationally transformed in many ways and internationally burnished in many venues.

Response beyond the technical

The above-mentioned scientific discovery and clinical practice were complemented by many other facets of KAUST's resilient response. Like all universities, KAUST virtualized its learning and those of its constituent on-campus K-12 school and its many pipeline educational, entrepreneurial and training programmes for many ages and career stages, from high school students to corporate inventors to academic administrators. It also virtualized its two-week Winter Enrichment Program (WEP) in January 2020. The latter gave global visibility to most of WEP's 72 speakers from 15 countries, with more than 7 million social media impressions and 540,000 views of live-streamed events on YouTube and Facebook. In keeping with its growing dependence upon international communication bandwidth, KAUST accelerated long-held plans to increase its data bandwidth, adding four 100 Gbps lines in January 2021 to global datapops in Singapore and Amsterdam. Furthermore, in a very short time, KAUST systematically hibernated those of its laboratories not pressed into R3T service in order to preserve experiments in progress and maintain equipment in ready-to-resume status.

KAUST's educational and enrichment virtualization campaigns were all mobilized during the year that Saudi Arabia held the Presidency of the G20. Unlike the Dubai 2020 World Expo, the Tokyo 2020 Olympics or the Glasgow 2020 IPCC COP26 meetings, the 2020 G20 did not pause for the

pandemic. Therefore, the same year that they were adapting to maintain the continuity of their regular work, KAUST researchers were also meeting regularly (virtually) with Saudi Ministers and other leaders to formulate G20 position papers, together with national academies from the other 19 G20 entities, to formulate the communique of the Science 20 Engagement group, or S20. Helping to draft the communiques on the Future of Health, the Circular Economy, the Digital Revolution and "Connecting the Dots" gave KAUST a strong sense of responsibility for going beyond research, education and innovation, to help define national and international priorities and policies — as a fully-fledged "fifth power". Indeed, in the aftermath of the G20, KAUST became the "central node" responsible for implementing and administering globally-sourced research funding for one of the main scientific outcomes of the 2020 G20 — an international coral reef R&D accelerator platform. It also became a key player in one of the resulting national objectives — the circular carbon economy.

'UNIVERSITY, HEAL THYSELF' ('KC3')

To be useful in national resilience, a university must itself be resilient. To this end, in April 2020, we convened the senior executives of the university's programmes and support units to form the KAUST Covid-19 Crisis Center (KC3). KAUST's predominantly expatriate population and high international traffic placed the university community in a potentially vulnerable state for its own health and in the politically vulnerable position of being an inbound vector of the SARS-CoV2 virus. Under the KC3, the university earned the trust of the national Ministry of Health by adopting strict isolation and prevention measures earlier than the nation did. It also created a digital dashboard to track the campus community's pandemic experience and keep community members informed and a human support structure for those infected to make quarantines practical and as stress-free as possible from a logistical perspective. After at first hibernating the majority of its laboratories in order to lower the occupancy density and reserve capacity for those laboratories essential to fighting the virus, KAUST subsequently reopened labs on a methodical schedule for researcher time-sharing with interspersed cleanings. KAUST not only developed its own tests as part of R3T, but also formulated its own test policies and it conducted mass testing and vaccination regimens with the help of the Saudi Ministry of Health for its entire campus community.

Exploiting a global retreat to advance

KAUST operational policies during the pandemic in terms of emergency provisions for students, post-docs and employees added to its reputation for

adaptability and resilience. An interesting dividend of the pandemic admissions season was an approximately 50% increase in the number of graduate applicants. Since the quality of the applicants was maintained in the higher-than-expected application pool, KAUST made approximately 50% more offers than planned. KAUST also digitally onboarded new graduate student admits and allowed them to commence distance education (with stipends) in advance of their arrival on campus. Taking additional advantage of its fiscal stability, KAUST also provided secure on-campus support for its graduates and research employees whose contracts terminated during periods when their moves to their next employers were prevented by pandemic travel policies. A reciprocal provision was made for incoming research employees, who were offered remote consulting contracts until they could assume their employment as residents.

The university also began to prioritize internally its requests for exceptional procurements during a period of limited international air freight and major delays, so that equipment essential to its R3T mission and its virtual makeover would not be slowed in competition with less urgent acquisitions. In view of a very sharp reduction in international passenger flights mandated by the government, the university worked with government and private interests to arrange charter flights from Dubai and London to Jeddah to return its own employees stranded abroad by pandemic measures. For employees who could not return for a variety of reasons, the university worked out, on a case-by-case basis, opportunities for employees to work from abroad and was transparent in documenting these provisions with its stakeholders, along with their motivations in terms of both keeping vital operations going without interruption and retaining talent in the midst of expatriate stress.

Modelling science-based policy

As KAUST and Saudi Arabia began to re-open in the spring of 2021, the KC3's thoughtful deliberations on the stages of re-opening, especially on testing and vaccination policy, became models for other national organizations. Public health versus personal freedom is a fundamental issue and nontrivial to resolve on a campus of 120 nationalities with widely different expectations for personal autonomy. Beyond being an academic campus with a research technology park, KAUST is a largely a self-sufficient and self-governing community, housing both employees and their dependents. The KC3 had to wrestle with what would be mandatory for all members of the community, what would remain non-mandatory but be highly encouraged, and what means could be used to incentivize the encouraged behaviour. This included access to various campus facilities and services for individuals in different states of vaccination and recurrent testing, bearing in mind that certain members of

the community are ineligible for vaccination and depend upon the actions of the balance for their own safety.

To address such questions of self-governance, throughout the pandemic university leadership invested significant time in self-education, listening to lectures from our faculty experts on epidemiological modelling, the interpretation of medical statistics, virology and molecular-based testing. While subject to social and political pressures, especially as a campus that operates its own K-12 school system, health facilities and a full slate of retail services to support a mixture of its own residential employees and commuting contractor employees, we determined to be science-based in all policy-making. We recognized that it was essential to provide sufficient education via regular bulletins and zoom-in "town hall meetings" to enlist the community's informed cooperation in the sacrifices we called upon ourselves to make. Among the "five powers," the university has the primary responsibility for giving a decisive voice to science in matters of policy and governance.

PANDEMIC LESSONS FOR THE POST-PANDEMIC ERA ('PCR')

From the vantage point of 16 months later, we are attempting to apply lessons learned during the pandemic to prepare for future opportunities and future societal challenges, which may look very different from the pandemic of 2020-2021.

Drawing invention from necessity

On 26 March 2020, one week after the launch of the R3T challenge, we introduced to the senior academic leadership team of the university a brainstorming exercise called the Post-Covid Resilience ("PCR") challenge. Its purpose is to enhance our resilience without losing a step in the pursuit of our central missions of research, innovation and education. Inevitably, as the entire world has developed a degree of fluency with video-conferencing, many of the ideas relate to hybrid physical-digital activities to augment what was primarily a universe of physically oriented activities (classes, committee meetings, workshops, etc.) before the pandemic. Even before the pandemic, there were many areas of scientific research that were not dependent upon local laboratories, such as particle physics, astronomy and high-performance or big-data computing, which typically access remote instruments and databases. KAUST does not engage in the first two, but engages intensively in the third, with more than half of the faculty on our local supercomputer, which entered the world ranked at #7 in 2015, and is scheduled to be refreshed with another globally highly ranked system in 2022. Indeed, a mixture of wet-lab and computational research, besides being scientifically opportunistic and

fruitful, is a robust plan for remaining productive during any period of lockdown or physical separation from a research campus.

As all universities are finding, there are numerous activities that can now be shared beyond the campus by digital means to some advantage, some of them revenue-generating. The flip side of these opportunities is that the field will be crowded with many post-pandemic entrants, so each university must seek its optimal investments in activities in which it can excel above others.

With many positive experiences with work-from-home and even work-from-abroad, the work week and the deployment of campus space beckon for re-evaluation. The academic calendar may also inherit new flexibility, for instance, with respect to scheduling student internships and curricular modularization.

Alumni, no matter how geographically dispersed, are now closer and their ties to alma mater can be enriched to mutual benefit. One of the main outcomes of the pandemic has been increased appreciation of serendipity of low-threshold in-person interactions, so the goal of PCR is to augment, not to replace.

Conclusion: the Pandemic is a crucible experience

In summary, the Covid-19 pandemic was a crucible for university resilience. It forced universities to look inward to their own strengths and vulnerabilities and it forced them to look outward to social expectations upon them and to their needs for cooperation from society. At KAUST, the R3T, the KC3 and the PCR have transformed us by enhancing creativity, enhancing communication and expanding imagination. Pandemic resilience provided all universities with unusually rich opportunities to demonstrate their soft power: they have been pioneers, think tanks and exemplars locally. Meanwhile, their naturally global networks have made them gateways of knowledge and cross-cultural perspective. Pandemic restrictions on both local support and global interaction have made it difficult for universities to sustain the vitality of their efforts, but in overcoming such difficulties in a variety of novel ways, universities have built capacity that will be exploited beyond the pandemic.

No institution would have elected to pass through the depths of the pandemic even with anticipation of the growth to result from it; too many suffered too much. At the same time, no institution should miss the opportunity to refine, redefine and robustify itself, and to magnify its soft power.

One of the greatest of all sources of soft power that universities can provide to their host countries is the training that they provide to those whose careers make them leaders in other countries — leaders in science, technology, health, culture, commerce, politics. These leaders rarely depart from their loyalties to the institutions and host countries that forged their careers, and, indeed, this is one of the greatest reasons to revert as rapidly as possible

to the in-person and globally connected character of university activity. As university communities everywhere prepare to reconvene in person, we do so with a new resolve, with new understanding of our importance and with newly deepened confidence in our resilience.

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CHAPTER 16

The balancing act between being the fifth power and being used

Bert van der Zwaan

Over the past year, a number of apparently unrelated incidents in which universities or scientists were involved attracted public attention. Closer scrutiny suggests that these incidents all are tips of the same iceberg, formed by the increasing pressure exerted by governments to use knowledge to their advantage. The first incident in February 2021 concerned the British Secretary of State for Culture, Oliver Dowden, who tried to prevent British museums and university scholars being too focused on so-called "negative history", when discussing the (illegal) origin of certain items in U.K. museum collections. A little earlier, the Dutch Ministry of Education and Culture announced its intention to close all Nuffic Neso-offices that now are the neutral representatives of the Dutch higher education sector in foreign countries. The minister preferred to have more control over these activities by relocating the funding to the science and technology representation at Dutch embassies. A third incident is the way an internationally well-respected scientist, Anthony Fauci, appeared to be used in 2020 by the Trump government in an attempt to reach its political goals. Those involved downplaying the importance of the Covid-19 pandemic in the U.S. Unrelated, but in the same context, is how the vaccine diplomacy of Russia and China unfolded over the first half of 2021, both countries clearly using their vaccines to gain political advantage. And finally, already for much longer a point of debate, there are the Confucius Institutes that the Chinese government has established in many

countries. In the Netherlands, in March 2021, it became clear that a professor of Chinese literature and culture at the University of Groningen was partly paid by the local Confucius Institute on the condition that he (and by implication the university) would refrain from "damaging the Chinese image". These are rather randomly picked examples out of many available, all at the interface between the university and society, or more precisely, between university and state. At that interface the university functions as an essential part of the modern knowledge economy and has a role to play in developing informed policies. But, by doing so, universities are at risk of being used or co-opted by governments in furthering the goals of the state. As such, the university is balancing more and more between becoming a "fifth power" (in addition to the three traditional estate-powers, and the fourth one constituted by the media) and being used.

SETTING THE STAGE

Michael Møller, then Director-General of the United Nations Office in Geneva (UNOG) and speaking of young students at the 2019 Glion Colloquium, noted that "on the one hand they are seeing a world in deep crisis, a world that — ecologically, economically, politically — seems to be teetering on the brink of collapse". But "against the doom and gloom of our time, there is a powerful counterpoint. By virtually every measure of well-being, humanity is better today than at any other time in its history." In other words, and to paraphrase Møller: the world has never been a better place to live in, yet we make less use of this opportunity than ever before.

Looking back over a little more than a century, the world indeed has gone through a cycle of significant change, and, as noted by Møller, in many ways World War I forms a watershed. From then on it was gradually recognized that the balance of power between states clearly no longer was a guarantee for peace. In 1919 the League of Nations was formed in an attempt to promote international cooperation, but clearly failed as illustrated by World War II. The start of the United Nations in 1945 can be seen as the second attempt to establish a new, multilateral order. Looking back, it is undeniable that this order, growing and deepening over the subsequent decades, resulted in an era of stable globalism. Emerging IT- and communication-technologies played an important role here, together with the increased connectivity through highly improved transport systems. The resulting intense multilateral, international collaboration led to an unprecedented open society, a true global village. This globalism reached a peak at the end of the previous century, but abruptly ended during the financial crisis of 2008-2011. For many, the realization dawned that neo-liberal policies and open trade had also created

serious problems. It became clear that the strong global connectedness causes a host of complications for the "home nation", not least the vulnerability it brings when calamities easily spread throughout the financial system and political blocks.

In many western countries the response to the events as set out above has been a surge in populism and isolationism. The Trump administration that came into power in the U.S. in 2017 can be seen as an illustration of this, hammering at the importance of the nation state, of foremost protecting the national trade interests and of prioritizing national interests over the wider issues of worldwide equity and stability. In propagating these notions, most populist movements appear to be characterized by a contempt for science and facts. By now it has become clear that in particular these movements contributed to the emergence of the so-called fact-free society, that is characterized by feeding one's own truth into one's own social media bubble and ignoring facts. The reaction of President Trump in 2020 on being defeated in the elections can be seen as a vivid illustration of this.

The recent events suggest that we are living in a polarized world, in Møller's words, on the "brink of collapse", which seems to unravel at all levels. It is a world in which multilateralism is under pressure, and new ways and means are being developed to solve global problems. And whether they like it or not, universities are in the middle of these attempts to create a new order, because knowledge diplomacy is rapidly constituting a powerful tool for states to gain geopolitical advantage or to forge alliances.

ABOUT KNOWLEDGE DIPLOMACY

Science diplomacy is a relatively young area of interest. The reasons for this has been first set out by Knight (2015) and Van Langehove (2016), although the basic issues involved had already been explained by Nye (2004). The idea behind science diplomacy, often regarded as a form of "soft power", is that in a world that is disintegrating more and more into separate political blocks, the binding power of diplomacy should be used in a wider sense than traditionally exercised. There are many sub-areas where diplomacy can be of use to represent national interests ("theme diplomacy", according to Knight, 2018), like health-diplomacy and education-diplomacy. Among these science diplomacy stands out as rapidly growing in importance. Van Langehove (2016) clearly explains the reasons behind this by pointing out that "the world is increasingly faced with a set of global problems and challenges that transcend national boundaries and that are threatening the whole of humanity, as well as the planetary biosphere. These global problems and challenges are on the one hand related to the globalization of human activities and on the other hand to human impact on the environment. Both the globalization

and anthropogenic challenges pose serious governance problems for the multilateral system."

Against the backdrop of decreasing multilateralism and decreased effectiveness of the inter-state discourse, other stakeholders get involved in global policy-making. In his 2016 and subsequent papers (2018, 2019), Van Langehove pointed out that "there is a need to develop a global science diplomacy agenda, consisting of three components: a Science in Global Diplomacy initiative aimed at mobilising the science and technology community to carry out research that is relevant for global problems; a Diplomacy for Global Science initiative aimed at facilitating scientific collaborations for dealing with global problems; and a Global Science for Global Diplomacy initiative aimed at developing the institutional nexus between the S&T community and the realm of policy-making at a global level." Knight (2015, 2018) was the first to make a clear distinction between soft power and science diplomacy, the latter often thought as a variety of the first. But she rightly suggested that the paradigm of power involves outcomes as win-lose or zero-sum game, whereas the paradigm of diplomacy involves win-win or mutual-sum game. In the latter, the relationship is horizontal, in the first vertical, whereas also the approaches (negotiation versus persuasion or attraction) are totally different. But it is generally acknowledged that, although the distinction is important, in practice there is a grey area between both paradigms.

Krasnyak (2018) analysed the styles of national science diplomacy of five countries (the P5, constituting the permanent members of the United Nations security council). She concludes that these countries indeed have different styles, based on differences in ambitions and abilities. Whereas Russia mostly is a receiver of scientific knowledge, the U.S. and the U.K. are actively pursuing global science diplomacy with the aim of global leadership, in line with their national perceptions and their more general diplomatic efforts. France, in contrast, aims for a more regional impact and its science diplomacy has a very strong cultural component, focussing on the global south, i. e. Asia and Africa. Finally, China is a newcomer on the scene, but is rapidly expanding its classical diplomacy with cultural efforts (Confucius Institutes) and science diplomacy in a more general sense. In this context, the One Belt One Road (OBOR) Initiative (also known as Belt and Road Initiative, BRI or New Silk Road Initiative, NSRI) plays an increasingly visible role in Chinese science diplomacy. According to Krasnyak, China is a "smart and sharp power in public diplomacy" with aspirations for global leadership.

Knight proposed the term knowledge diplomacy as being more inclusive and comprehensive than science diplomacy. In the general chorus of enthusiasm, she is one of the few who points out (Knight, 2018) that knowledge diplomacy can have unintended consequences. One is that countries can use the knowledge as a weapon to enhance self-interest, competitiveness and

dominance. She states that "this is why values and principles are important", referring to the risk that knowledge is used to widen the divide between countries instead of forming a bridge. And of course, knowledge diplomacy "can easily become a buzzword to camouflage national and regional ambitions to promote self-interest at the expense of mutual interests and benefits". It is evident that value systems differ between nations. Crucial in the present context, however, is whether these systems collide with the universities' widely accepted values of academic freedom and truth. This topic will be addressed later in this paper.

The layers of knowledge diplomacy

Higher education is one of the central areas of knowledge diplomacy and one in which the world has a lot of experience. Many countries have active policies in place, mostly focusing on student mobility. It is clear that in this respect the Anglo-Saxon countries, notably the U.S., the U.K. and Australia, are frontrunners with longstanding traditions. The British Council, for example, is very active and published in 2019 an interesting analysis of the HE policies of 26 countries. The common denominator is that almost all countries welcome an increase of student mobility, which in most countries is driven by the HEIs but financed by governments, the latter having a keen interest in preventing brain drain and importing talent. It is clear that internationalization of higher education is more and more a key area of the economy and important for the reputation of the national education system. The latter is reflected in the international university rankings, forming another incentive for internationalization.

Knowledge diplomacy takes a much more inclusive approach than student mobility alone. It increasingly builds on a multidimensional approach that emphasises that the whole is greater than the sum of the parts. In addition to the basic category of international higher education, mobility and training, it includes the layers of research and innovation. We are already so used to many of these activities that they are not recognized anymore as part of knowledge diplomacy. As far as higher education is concerned, the EU Erasmus+ programme is a very successful example. As an example of the second category, research, another EU programme (Horizon 2020) immediately springs to mind. But also activities centred around major science organizations (IPCC; the World Meteorological Organisation WMO; CERN) form prominent successes of knowledge diplomacy, all contributing to a greater collaboration between nations, at the same time furthering the interests of all participating states.

The third layer of science diplomacy is the science and innovation strategy many countries have developed over the past decades. Rüffin (2020) compared the strategies of some countries and concluded that while most

have science and innovation agencies, the way these networks are used is quite different. While smaller countries like Switzerland, the Netherlands and Denmark use their networks for the promotion of domestic research, innovation and products, the U.K.'s network, for example, engages in a broader spectrum of activities at the nexus of science, economy and foreign policy objectives. In this context, López de San Roman and Schunz (2018) reviewed the E.U. position over time. In their detailed paper they conclude that the E.U. is still wavering between a knowledge policy that is "diplomacy for science" and "science for policy". They show that whereas the classical E.U. policy is driven by the "market power Europe", thus basically a science and innovation policy, it more and more tends to be driven by the "normative power Europe", thus a policy where science is used to reach diplomatic goals, for example in the context of the climate crisis.

From soft power to the higher power spectrum

In an interesting paper Bateman (2019) describes British science policy in the early 1980s, when President Reagan called upon the American scientific community to use its talents to develop a capability that would render nuclear weapons obsolete. Bateman's examination of top-secret documents from that period, in the meantime made public, shows that the U.K. government decided to participate scientifically in this so-called Strategic Defence Initiative, in spite of a strong scepticism about its potential scientific success. But the collaboration offered a great opportunity to become intimately knowledgeable about the initiative and to have the possibility of exerting influence. This complex motive demonstrates how science was used outside the original scientific objective and put to action in the political power arena. An interesting and very recent example of a completely different nature, in which knowledge is effectively put to use to gain geopolitical influence, is the Chinese and Russian vaccine diplomacy in the context of the Covid-19 pandemic. Making use of their rapid development and production of vaccines, they offered these to (in majority) poor countries. However, the choice of countries reveals that the poverty is not the yardstick, but the potential of gaining key geopolitical influence.

At first glance outside the realm of knowledge diplomacy is the New Silk Road Initiative (NSRI), or as named in 2013 when China initiated this, the One Belt One Road (OBOR). The NSRI is the largest modern initiative that straddles all aspects of knowledge diplomacy, ranging from science for diplomacy to eventually the creation of debt-traps and subsequent possession of crucial infrastructure. At first sight, NSRI is predominantly driven by an economical strategy of opening up trade routes supported by large-scale infrastructure, aiming at enlarging the geopolitical influence of China. As such, it is interesting to compare it with another initiative of the same size although

in a completely different context, the Marshall Plan in which after WW II the U.S. deployed rather similar activities. Shen and Chan (2018) made such a comparison and conclude that many elements, like countering rivals and creating division, are comparable. What is less well-known is that in both programmes knowledge diplomacy followed the primarily economic initiative. This was and is in the form of forging scientific alliances, gaining knowledge, and picking talent. The U.S. has been extremely successful in this, and now China is seemingly on the same course. Although initially NSRI appeared to lack any cross-cultural engagement, more and more elements of this now emerge. There seems to be a clear strategy connected to NSRI of establishing Confucius Institutes with the purpose to promote Chinese culture, of stimulating student mobility towards China and of establishing university networks (Kirby & Van der Wende, 2018). Regarding the latter, the University Alliance Silk Road (UASR) today counts a considerable number of European members.

BEING PART OF THE SYSTEM, WHAT ABOUT ACADEMIC FREEDOM?

The globalization of the past 50 years has revolutionized HE and transformed it into a truly international endeavour, in which more and more collaboration is the only way to reach impact and innovation. Adams (2013) made an impressive case to illustrate that it is very likely that "institutions that do not form international collaborations risk progressive disenfranchisement, and countries that do not nurture their talent will lose out entirely". At the same time, this connectedness induces significant risks of becoming too dependent on outside resources, being finance or talent. Johnson *et al.* (2021) analysed this dependency with a focus on the U.K. and China. They conclude that the risks for the U.K. are very considerable and state that "reliance on significant tuition fee income from Chinese students to cross-subsidise loss-making research, creates a strategic dependency and potential vulnerability".

Universities are not always aware of the fact that there is a reasonable chance that they are part of the knowledge diplomacy of some country. Yet, closer inspection shows that universities are pivotal in the shaping of any successful knowledge diplomacy. They participate in collaboration programmes, profit from funding in the context of joint international research programmes and are instrumental in international student mobility. But with being such an essential part of the system comes a specific responsibility for its purpose and effect. The core of this pertains to the question of what happens with the knowledge that is intrinsically part of knowledge diplomacy and to what extent the university remains responsible and/or should take responsibility when it is observed that the knowledge is distorted or ill-used. And, of course,

the ultimate question is whether universities consciously participate or are unaware of being used or co-opted, and to what extent they risk compromising their academic freedom and their ability to speak the truth when they become part of knowledge diplomacy. The latter would seriously undermine their public authority and damage their reputation as independent speakers of truth.

There is a strong parallel between the developing ideas of academic freedom and the concept of truth over time. That is understandable bearing in mind that it is precisely the pursuit of truth and knowledge that justifies academic freedom. Post-modernists stress the socially-conditioned nature of knowledge and doubt the paradigm of truth. Over the past decades this has led to a fierce debate in which some consider the post-modernists as start of the "post-truth" or "post-fact" society, i. e. a society where truth is not unequivocally connected to facts. In an interview in *The Guardian* in February 2017, Daniel Dennet (2017) made the connection between post-modernism and the post-truth society most directly: "I think that what the post-modernists did was truly evil. They are responsible for the intellectual fad that made it respectable to be cynical about truth and facts". It is no coincidence that over exactly the same period of time in which the concept of truth met with scepticism, academic freedom increasingly came under pressure, many think because of the marketization of higher education (see Brown & Carasso, 2013; Wilby, 2020). But one could easily argue that marketization could spread through the university because a more relaxed view on academic freedom led to the weakening of the concept of truth.

In his book *Post-truth* (2018), McIntyre rightly points out that a number of other mechanisms also endanger our common understanding of what truth is, and lead to the public disputing of facts in the media and in politics as we see today. Although it might be true that post-modernists laid the foundation for doubting any truth, it is clear that social media offer the perfect technological venue for making one's own community in which one's own truth prevails. This is considered by many the most powerful driving force of the modern "post-truth era". As such, and quoting Baggini (2018), "the post-truth society is in part a result of a malfunctioning of this social system of knowledge. By retreating into bubbles of the like-minded, people can strip out a lot of inconvenient complexities a wider perspective would give, leading to a simpler but therefore also distorted network of belief". In this context, Chomsky's essay (1967) on "The Responsibility of Intellectuals" is still valid in the sense that also universities have the responsibility "to speak the truth and to expose lies", even in a politically sensitive context.

Møller rightly pointed out that universities are increasingly part of the inter-state discourse. But more than only being a passive component in this, universities need to realize that they remain responsible for their knowledge and how it is used in international knowledge diplomacy. It is therefore

too limited if they only consider the short-term benefits, like funding for research collaboration, or for increased student mobility, or rising in the rankings. Being part of the inter-state discourse begs the question to what extent universities want to be part of the political system accepting its aim and purpose. And this is at the heart of academic freedom. A serious warning in this context is provided by the measures taken by the Chinese government when in 2017 an official of Nottingham University criticized the communist party. Similarly, there is the example of a professor of Chinese literature and culture at the University of Groningen (the Netherlands) already described in the introduction of this paper. Knowledge diplomacy offers unprecedented opportunities for universities and scientists to speak up and have impact on a society that struggles with multilateralism and faces huge challenges for the future. But the examples show that they should be keenly aware of the fact that governments also can use them to further their own goals and therefore they should weigh carefully when to participate.

THE DILEMMAS

The globalism of the past decades clearly is under pressure, and in a rather short time the world has changed into a multipolar world in which the gravity of power is divided over a number of countries and political blocks. Together with other factors, this has led to an erosion of multilateralism. In this changing world, networks are playing a prominent role, and "interstate diplomacy is joined by a new web of networks made up by governments, companies, NGOs, terrorist groups, philanthropists …. and countless others — all wielding influence and cooperating or clashing at various points in time" (Møller, 2019). It is in this context that knowledge diplomacy is rapidly gaining importance. The reason behind this is that universities provide ready-made networks, and that talent and knowledge are powerful elements to build bridges and/or to gain influence. And whether they like it or not, and whether they are aware of it or not, universities are thus part and parcel of this new "web of networks".

Universities stand in the tradition that scientific knowledge is eventually for free and public, in the sense that the scientific discourse is only effective if new insights are disseminated and shared, and only a contribution to science if published. But universities should realize that now, more than ever, nations are interested in using that knowledge for other purposes. A particularly striking example is formed by the vaccine knowledge build up by universities and companies, and which was subsequently used by the Chinese and Russian governments to start "vaccine diplomacy". The same could be said of western nations, where companies make use of knowledge gathered by universities in the public domain and sell the vaccines to the highest bidding countries. And there are many more examples of such dilemmas where to participate

and where not, some already mentioned before. There is the one posed by receiving too many foreign students from one country, unwillingly creating the strategic disadvantage of becoming too dependent on, or vulnerable for, that country. Or the dilemma that exchange students of the Chinese so-called Seven Sons universities, which have close ties to the Chinese army, focus in particular on foreign strategic knowledge as was shown to be the case for Delft University, the Netherlands. Or more in general, to what extent strategic knowledge can be disclosed. Underlying this is the dilemma whether a university should be involved in strategic research that is secret and therefore in conflict with the central tenet of any university that knowledge is eventually public. Or what to do if members of staff accept a contract with regimes that do not subscribe to academic freedom: is the university then in turn entitled to restrict their freedom of research and forbid the contract? When do universities follow their national foreign policy, and when do they stand up and refuse? The latter is not a theoretical issue: think about the change of policy in the U.S. since the elections in 2020.

This raises renewed questions in the old debate on who owns knowledge and what the role is of universities in the context of this commercial or diplomatic competition. Science or knowledge diplomacy is rapidly diversifying and now ranges from arranging student mobility between countries, up to initiatives like the NSRI, in which knowledge is traded in order to strengthen the economic power base of China and widen its geopolitical sphere of influence. In between these extremes there is everything from exchange of knowledge and staff, up to selling knowledge and innovation. More than ever universities should realize that knowledge diplomacy is becoming a powerful tool in global governance. In that context they should be more aware of why and how they are used by governments and carefully consider to what extent their academic freedom is threatened or not. If so, they should speak up clearly and without regard for the consequences, since for now the only weapon universities have to prevent becoming part of a process they do not wish for, is complete transparency, which stimulates public debate and leads to considered decisions and participations. Chomsky wrote in 1967: "It is the responsibility of intellectuals to speak the truth and to expose lies. This, at least, may seem enough of a truism to pass over without comment". In the coming years knowledge diplomacy will offer universities unprecedented opportunities to have impact on society, but this requires that they constantly weigh up when to participate, and fiercely protect their academic freedom to speak the truth.

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CHAPTER 17

Science, Information and Democracy

Yves Flückiger & Anne Laufer

INTRODUCTION

While the question of strengthening legislation to counter fake news is being debated in many countries, universities need, in this respect, to rethink their role, their education programmes and the place of their expertise. If scientists are ready to reinvent their way of communicating, the question of the means at their disposal remains.

Fake news intends to undermine democracy with the very tools of democracy, creating widespread doubt. The word of scientists becomes entangled in a flow of diverse and varied opinions. People tend to look for univocal solutions while what we need is real debates, even more so on complex issues such as pandemics and climate change. Democracy needs well-informed citizens and elected officials, and universities — where we learn, research and debate the issues of our time in the wake of truth — have a crucial role to play.

However, the last decade shows that there is a challenge for universities and researchers to work out the right way to interact with society and politics. Some researchers will have to come down from their pedestal and explore new areas, identifying new points of access to scientific knowledge. Universities must also keep on developing new teaching methods to awaken critical thinking, empathy and openness to other viewpoints and other backgrounds.

INFORMATION IN 21ST CENTURY DEMOCRACY

Ignacio Ramonet was the first to evoke the concept of the 5th power, in a critical theory of the media (Ramonet, 2003). He considered that since united within "corporate media giants", journalists and media had gradually ceased to function as a counter power, no longer fulfilling their mission to denounce violation of human rights and serious abuses of power in democratic countries. For Ramonet, a new counter-power was needed, and he suggested that the fifth power could be that of the citizens. He proposed the creation of Media Watch Global gathering journalists, academics and citizens, and proclaimed the 21st century "the century in which communication and information at last belong to the people of the world". That was in 2003 and social media were just emerging. Ten years later, with the Internet and Web 2.0, citizens had spontaneously undertaken to act as a 5th power, one that observes, criticizes and even invectives the 4th power, that of the media and their journalists (Bernier, 2013).

Overabundance and misinformation

Some 20 years later, we have become aware of how radically the digital revolution has changed the relation to information and to the way knowledge is stored, retrieved and used. Scientific conversation is no longer just taking place in "ivory towers". Nowadays, everybody claims to be an expert. With the multiplication of information channels, we experience in our daily life a constant flow and overabundance of information, some accurate and some not, which makes it difficult to find trustworthy sources and reliable advice when people need it. As WHO Director-General Tedros Adhanom Ghebreyesus said in February 2020: "We're not just fighting an epidemic; we're fighting an infodemic. Fake news spreads faster and more easily than this virus, and is just as dangerous." Widespread accessibility of global information and the pressure of time leads, among others, to compare situations with a lack of consideration for the different contexts. In the midst of the pandemic, measures introduced in different countries were indeed often compared without taking into account the variety of contexts. Social media, which have long been seen as the medium of true democratic expression of the people, have become an ocean of misinformation, easily manipulated. And attention rather than information or knowledge has become a critical resource, leading to what we may call the economics of attention or the search for "clicks". If two scientists disagree (a natural and even necessary situation within the world of science), media will likely set them one against the other, thus trying to gain visibility. The recent period is full of examples of these controversies that have shaken the scientific community.

Sound debates and freedom of speech in decline

Social media and Web 2.0 have also built bubbles of comfort in which everyone is fueled by elements in line with his viewpoint, kept away from content that does not conform to his tastes and from opinions diverging from his own. In his controversial essay published in 2019, the novelist Bret Easton Ellis (Ellis, 2019) speaks out against the standardization of thought and recalls 1990 as a time when "people also listened to one another, and ... as a time when you could be fiercely opinionated and openly questioning without being considered a troll and a hater who should get banned from the 'civilized' world if your conclusions turned out to be different". A feeling shared by the journalist Jean Birnbaum, who discusses in his recent essay (Birnbaum, 2021) the extreme polarization of public and private discourse and the increasing difficulty in maintaining an open and argued discussion in the public space. As a counter-effect of the 2.0 society, the room for sound controversies and true debates seems indeed to be shrinking. We could also question to what extent freedom of speech is threatened within the media — with increasing situations where editors have to defend or excuse the content published in their pages — or even within the universities themselves.

Economy of fake news and data control

Fake news is not a new phenomenon, but a fundamental aspect of the problem has changed: the economics of information control. The political economy of fake news is not often addressed, probably because the idea of freedom of information, which takes many forms such as freedom of the press or the absence of censorship on the Internet, imposes a certain taboo on the issue of control. Yet there is no flow of information without control. Freedom of the press can only be guaranteed by controlling the economic and legal functioning. With the information society and the emergence of large intermediation platforms through which a growing proportion of global exchanges, whatever their nature, transit, the control of information flows has changed radically. The volume of information has grown exponentially. The number of people able to produce information has gone from almost no one to almost everyone. The unit of time has shrunk to the nanosecond. Flows have diversified and have definitely moved out of the channels they were in a quarter of a century ago, and now transit through global digital platforms. The control of information, of data in general, whether in a static state, stored in a data centre, or in a dynamic state, moving in a network, is one of the technological challenges of our time. Mass digitization has enabled many new services and at the same time opened up a new field of risks, related to data leakage, whether for accidental reasons or as a result of malicious attacks. The World Economic Forum, in its 2018 Global Risks Report, estimates that fraud and data theft

are among the risks with the highest probability after extreme weather events, natural disasters and cyber-attacks.

The political economy of fake news is therefore part of a much more general issue of data control, which includes many dimensions such as the protection of personal data and privacy, the protection of institutional data whose leaks are made public by actors like Wikileaks, the protection of intellectual property, the right to be forgotten, political censorship, etc. This information insecurity is widespread and threatens individuals as much as companies, administrations or States. In addition, our era demands transparency both of public action, through the publication by default of all its data which do not benefit from any particular protection preventing their free circulation, and also of the algorithmic processing carried out on the data by the major operators, generally private.

The issue of fake news is therefore far from simple to resolve, neither from a technical nor from a political point of view. It occurs in a post-political context, where ideologies seem to have given way to a universal economic rationality, which weakens the point of view in favour of the Truth. Conversely, the fundamental debate on climate, as with scientific productions in general, is now confronted with a very strong politicization, which reduces these productions to the status of opinions. The rise of censorship and control of information, which now affects most information channels around the world, accompanies a more general transformation of politics at the global level. It may be useful to recall the *Washington Post*'s motto, "Democracy dies in darkness".

EXPERTS IN 21ST CENTURY DEMOCRACY

Disinformation plays a significant role in shaping people's opinions and in our "living together". It is a challenge for democracy, and it is a challenge for the experts. How do they and how should they evolve in this new landscape?

Initially the concept of expertise was linked essentially to the legal field as the "measure of instruction by which experts are charged with carrying out a technical examination and presenting the result in a report to the judge". From the 18th to 19th centuries, the expert gradually emerged outside the legal field as a specialist chosen for his technical skills to enlighten the authority, and, then, in a broader sense, as any person empowered, on the basis of his specialized technical skills, to provide *assessments or evaluations that exclude any subjectivity or personal opinion*. The expert is free of any interest in the case on which he or she is giving an opinion, and acts within the framework of precise knowledge. If he or she guides the decision-making process, he or she is, in this sense, part of a strictly scientific register of action. The advisor, on the other hand, assumes a political subjectivity. As the holder of knowledge

and competence, the expert does not, however, derive his or her legitimacy as an expert from himself or herself, but from the political authorities: it is the latter who, faced with a delicate problem, will call upon him or her for a specific mission and in a precise role.

Science and political decision-making

This initial vision of the role of science has gradually been juxtaposed with a broader understanding of the expert, conceived as a mediator between reality and politics. An "antidote to ignorance", the expert, responsible for producing and mobilizing all the knowledge necessary for the decision, then becomes capable of enlightening the decision by linking his or her opinion to a field of objectifiable knowledge. There is therefore a real "science of scientific advice".

Lastly, expertise fulfils a legitimizing function with regard to political decision-making: its prominence responds to the concern of decision-makers to "base their discretionary choices on scientific advice" (De Munagorri, 2002/3) , particularly when these relate to complex matters. Its presence responds to the desire for a "scientific" and "rational" management of society, the origins of which can be traced back to the Saint-Simonian tradition. The appeal to the expert — and more broadly to the wise man — manifests "the devotion and abnegation of the government team, which sacrifices its political interests to the universality of knowledge for the common good". The latter is then a "reservoir of authority": it contributes to "increasing public confidence in governance", but also to building alliances between public and private actors, both inside and outside the political field (European Commission, 2001). The use of expertise can be part of the influence strategy of public administrations, which are able to draw on another type of legitimacy, as they cannot rely on democratic legitimacy.

Expertise has emerged as an essential means of legitimization for the European Commission in the face of national governments. Reflecting this evolution, the Joint Research Centre (JRC) originally established under the Euratom Treaty has become the European Commission's science and knowledge service, "supporting EU policies with independent scientific evidence throughout the whole policy cycle". Observing that "science, politics and the people are harder ever to align" and stressing that although science and policy are different worlds they must "collaborate closely in order to address wicked problems of our age", the JRC published in 2020 a "Science for Policy Handbook" (JRC, 2020) providing advice on how to bring science to the attention of policy-makers with ten tips for researchers.

However, recourse to expertise also presents a certain number of risks for the political authority: To resort to the expert is in fact to suspend its judgement and to abstain from exercising part of its prerogatives; it is to mark a

break in the political temporality and to open up the public decision to debate; it is, then, to expose oneself to the risk of having to assume an unpopular decision or, conversely, to have to justify a choice that goes against the expert's opinion. Finally, it means running the risk of the expert and, through him, his client being challenged or questioned.

Whether it is claimed in the service of an ambition for technical rationality, denounced in the name of the integrity of the democratic debate or contested in the context of scientific controversies, expertise has undeniably taken on a predominant role in the implementation of public action. It has been fueled by the proliferation of socio-technical controversies, but also by the rise of the economics of regulation and the development of risk assessment practices, which have had numerous applications in the field of public health.

Covid-19 as a case study of the role of experts

The health crisis triggered by the coronavirus pandemic marked a consecration of the role of experts, who are called upon, in the face of an immediate risk and a new threat, to shed light on public decision-making in a situation of uncertainty. As such, it offers a privileged opportunity to reflect, in a comparative perspective, on the ways in which expertise is integrated into the decision-making process.

The pandemic has plunged the whole world into a state of stupefaction from which it has not yet emerged. The health crisis is coupled with a no less serious economic and societal crisis. Scientists are called upon as experts in the urgent need to save lives, and answers are expected from them by political decision-makers, as well as by citizens. The questions addressed to the scientific world are as varied as they are complex: what is the nature of the virus, its origin, its mode of propagation, its mutation mechanisms, what are the best treatments and the best vaccines, how to best mitigate the impact of the crisis on the mental health of the population, how to re-launch employment, etc? Not all of the knowledge that is being passed on is reliable, in confusion and within extremely short deadlines by scientists, experts or not. The result is damage to public opinion: confidence in expertise is weakened and mechanisms for blocking extreme opinions are being put in place. The responsibility of the media is also largely engaged.

Recalling the lessons of a smallpox epidemic that raged in Montreal in 1885 offers a useful insight into the current crisis on the role of experts and their communication with citizens. The Canadian population was then politically divided between French-speaking Catholics and English-speaking Protestants. The smallpox epidemic killed several thousand people in the city of Montreal, despite the surveillance, isolation and vaccination measures deployed by the public authorities. The deaths were mainly among Catholics, who had been reluctant to be vaccinated.

The experts' consensus on the benefits of the vaccine had given rise to mistrust on the part of some of the inhabitants. Many analysts attributed this mistrust to the obscurantism that had long marked the history of the Catholic religion. On closer examination, this view is simplistic. It appears that the reticence was very much about obeying the injunctions of officials in the context of high political tension between the two communities. Thus, the English-speaking industrialists had the means to force their workers to be vaccinated, while a less privileged and less well-supervised population living in the poor sanitary conditions of the cities of the time escaped. Finally, the medical community in Quebec was divided, with some experts, including some of the most progressive, claiming that vaccination was neither the only nor the most appropriate remedy for the epidemic. The authors of the Canadian study conclude: "The multi-dimensionality of the socio-political issues related to expertise, the often-blurred lines of division between social groups, and the inadequacy of scientific consensus alone to resolve many issues characterize today's debates in a range of fields" (Claveau & Prud'homme, 2018).

An expert masters knowledge at the highest level in his field of competence. This excellence in a field of knowledge generally sheds light on only part of the problems raised by the expertise. Moreover, it is not infallible. The results of the work of a group of experts always reflect a state of knowledge that may evolve or even be refuted. Furthermore, when an expert is consulted to give advice to a decision-maker, it has been well emphasized, particularly by lawyers, that the respective roles of experts and decision-makers should not be confused, and well explained to the public. Finally, in a context of political decision support, the expert is part of a collective whose establishment, operating rules, scope of expertise and the appointment of its members largely determine the level of trust that can be attributed to him or her. These elements are determined by the authority commissioning the expertise. When the authority is a political one, it is worth examining how these elements were conceived and implemented, as they largely determine the capacity of the collegiate expertise thus constituted to respond to the request. Faced with the need to inform their decisions with the help of existing knowledge, many States have set up permanent expert structures focused on risks — natural, health, technological, etc. — from which they expect both reliable information for themselves and protection against being challenged by the public in the event of unfortunate decisions. A fine balance is here at stake. It is well illustrated with, on the one hand, the Swiss Minister of Health acknowledging in an interview conducted by Swiss television in May 2021 that among his mistakes, he "hadn't questioned the science enough at the beginning" and, on the other hand, the Hindu nationalist leader being, in an article published in *Le Monde* in the same week of May 2021, criticized for having despised science and defied intellectuals, an "obscurantism" which obviously played a significant role in the country's helplessness in the face of the epidemic.

Science Diplomacy and crosscutting experts' platforms

Science diplomacy is broadly understood as a series of practices that stand at the intersection of Science and Diplomacy. It concerns all initiatives that help to address global challenges, promote understanding and increase influence and prosperity. The concept of science diplomacy in the academic world is of relatively recent origin. The intensification of research, including attempts to define and classify practices that can be included in the science diplomacy category, date from the beginning of the 21st century. Attempts to conceptualize science diplomacy are still ongoing. There exists neither a clear-cut definition of the term nor a consensus on science diplomacy's stakeholders, instruments and activities. The debate is attended by researchers who treat science diplomacy as an empirical object and by actors who are or have been involved in science diplomacy practices in various ways. These are career diplomats, science counsellors/advisers, experts to national and international decision-making bodies, and politicians. They perceive science diplomacy through the lens of interests (national, group) and goals to be fulfilled. Therefore, the definition of science diplomacy is not based on analytical categories but draws its meaning from a compilation of different narratives, approaches and ideas of changing relations between science and politics, science and foreign policy and the evolution of diplomacy as an institution of international relations.

Before the term science diplomacy was coined, such initiatives were often called "smart power" or "soft power" by those in the field, namely Joseph Nye of Harvard University in his 1990 book, *Bound to Lead: The Changing Nature of American Power*. His notion of "smart power" became popular with the term's use by members of the Clinton and Obama administrations, although the Obama administration also used the term science diplomacy. Recently, the Royal Society and the American Association for the Advancement of Science indicated that "science diplomacy" refers to three main types of activities:

- Science for diplomacy which is related to the use of science to advance diplomatic objectives in particular but that could be also thought as the use of science to answer more broadly challenges that government or international organizations have to face;
- Diplomacy for science that concerns the use of diplomatic actions to further scientific and technological progress and finally;
- Science in diplomacy — the direct involvement of science or scientific actors in diplomatic processes to improve international relations.

A variety of multi-disciplinary and multi-institutional platforms bridging the world through science have been launched lately, such as the Geneva Science-Policy Interface (GSPI). Backed by leading research institutions

in Switzerland and Europe, the GSPI is an independent, neutral platform founded in 2018, that strives to enhance scientific engagement with global governance actors within the international Geneva ecosystem. By supporting collaborations between scientists, policy and implementation actors, the GSPI contributes to facilitate the emergence of effective, evidence-informed policies and solutions to complex global problems. It is based on three pillars: (1) *Tailoring knowledge for international decision-making*. As we know timing, digestible formats and human interactions can result in higher research uptake and better decisions. As such, the GSPI works with academic experts to produce policy briefs, which are scientifically robust yet concise digests of knowledge. (2) *Matchmaking activities, strategic partnerships*. Thanks to the Impact Collaboration Programme (ICP), the GSPI harnesses and supports promising collaboration projects between scientists, policy and implementation actors aimed at addressing practical science-policy challenges for the benefit of global governance actors. (3) *Producing and disseminating knowledge in the field of science-policy engagement as well as practical tools and learning opportunities* with the aim to enhance collaborative skills and culture between science, policy and implementation actors. The combination of these activities aims to create a more enabling environment for impactful science-policy collaborations and to position Geneva as a hub for evidence-based thinking in the field of global governance. Other platforms contribute to this same goal, such as the Geneva Science and Diplomacy Anticipator (GESDA) and the Swiss Digital Initiative (SDI). Created in 2019 on the initiative of the Confederation, the Canton and the City of Geneva, GESDA aims to anticipate tomorrow's scientific and technological developments in order to meet today's global challenges and promote inclusive development. Headquartered in Geneva, the SDI builds upon the numerous initiatives and commitments released by States, international organizations and the private sector and aims to enable a global dialogue on the ethics of digitalization. It brings together academia, government, civil society and business to find solutions to strengthen trust in digital technologies and in the actors involved in ongoing digital transformation.

Science and Media

Access to diverse and quality information for as many people as possible is fundamental to democracy. However, at a time when it is more necessary than ever to multiply expert views on increasingly complex information, scientific journalism is withering away. As in other countries, the number of science journalists in Switzerland has shrunk. Switzerland is the world's leading country in terms of scientific publications per capita and it would make sense that its media can easily draw on this considerable local wealth. All the more so in a context where the continuous flow of news leaves less time

to identify reliable sources and the media increasingly need experts to check facts quickly, contextualize news and produce quality information. On the other hand, for universities, collaboration with the media is a key element, as it allows the large-scale valorization of publicly funded research. Thus, in order to better connect science and media, the Swiss Radio Television (RTS) and the universities of the French-speaking part of Switzerland launched in 2013 "Avis d'experts" (AdE), a platform bringing together several thousand contributions from academics who analyse current events in all fields in a simple and objective manner. Designed to give equal value to journalistic and scientific expertise, by contextualizing news in a robust manner, AdE is a professional open-access tool that allows: 1) journalists from all the media in French-speaking Switzerland to quickly identify experts, 2) knowledge institutions to monitor their scientific communication strategy in the media, 3) the general public to obtain reliable information — even if they are not the main target of the website. Other considerations are also under way at the national level to boost science journalism, including reflections on its interaction with universities and their communication departments, which have gained in importance in recent decades.

CONCLUSION: A NEW ROLE FOR UNIVERSITIES IN 21ST CENTURY DEMOCRACY

While academics sometimes see their work dismissed as just another "opinion", and while fact checking is showing its limits, the university community must reassert its responsibility to rehabilitate knowledge, science and reason, and to promote argumentation, critical thinking and analysis of information content. Science needs to build public trust and to be better heard by politicians and policy-makers, who are assailed by messages from many lobbyists.

The platforms mentioned here above, whether related to the Covid-19 crisis, to science diplomacy or to science journalism are fields of experience and there is much to learn from their successes and failures to improve our skills in knowledge brokering. In this respect, universities face various challenges: they must learn to deal with the issue of long and short term in research work and its dissemination; be committed to fighting against mistrust in science; find ways to improve the dialogue between scientists and policy-makers; professionalize expertise transfer; raise their impact on societal debates; enhance coordination between all academic actors on common issues and sensitive topics and develop citizen science to access the questions people have and enable them to be involved in research projects in order to better understand how science works.

This means among others that scientists need to stay in their field of expertise and learn to communicate better. Science communication is not

a crisis discipline. Following the recommendations proposed by Blastland *et al.*, (2020), scientists should inform rather than persuade to demonstrate the honesty of the experts. They should target misinformation and not over-communicate as some of them may be tempted to do because of their rockstar status which can make scientists feel that everyone wants their opinion on everything, all the time. In all circumstances, transparency is essential to highlight the costs and benefits of each measure that could be proposed by experts. And in any cases, it is crucial to present the uncertainties associated to each result and establish evidence of the quality of the analyses. These two last conditions are particularly important to discuss and comment the strengths and weaknesses of methods and measurements.

"Again, there are walls: walls in our minds — of ignorance and narrow-mindedness. They exist between members of a family as well as between social groups, between those of different skin colours, peoples, religions." These are Angela Merkel's words in her Commencement Address delivered at Harvard University in May 2019. Universities must reinvent their educational model to prepare future generations for these challenges. They need to teach openness and respect of others, in a multicultural and diverse environment. It implies willingness to listen to different opinions and the ability to include as many perspectives as possible in decision-making processes. It implies making students and members of the university community at large aware of their own preconceptions, so-called blind spots, in order to grasp their biases previously ignored. It implies fostering historical awareness and a sense of historical urgency (a strong sense of "now"). This awareness can help understand the role of ancestors in shaping the present, recognizing both their positive legacies and their wrongs. It can help to grasp the irreplaceable nature of the past and the mistakes that have been made, in order to build the future.

The fight against fake news, or more precisely the *fight for authentic/critical news/information* is part of several of the missions of universities: education, as well as the production, dissemination and promotion of research and of scientific and technical culture. Nevertheless, universities must also play a civic role in the city, by fighting against extremism and obscurantism. The university community must commit itself to safeguarding universities as environments where freedom of expression and real debates — with contradictory but respectful point of views — are preserved. Scientists need to discuss new fields of research such as fake news, alternative facts and post-truth, work on new methods of knowledge brokering and communicating science in a comprehensive way towards society as well as considering the intellectual commitment that poses the "question" of expertise in democracy.

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Concluding Comments

The focus of this year's highly successful 13th Glion Conference was on the growing power and responsibility that our world's top universities have in the organization, development and betterment of our society. Following up on key themes of both the 11th and 12th conferences, where it was acknowledged that political events across the world were undermining the vision of a global village, we focused on the unique and almost singular role that universities now hold as venues where ideas and discoveries can be freely exchanged and where scholars can conduct their work across continents, bringing the world together. As if to underscore the fact that despite gaping political divides, we *are* living in a highly interconnected world, this conference took place in the shadow of Covid-19, which continues to remind us just how borderless we really are. Neither viruses nor greenhouse gases nor toxic ideologies respect lines upon a map.

A core group, mostly from the European continent, joined by two from the United States, attended in person (two-thirds of the participants), with others zooming in from Asia, Africa, Canada and South America, countries where international travel wasn't possible or would have resulted in lengthy quarantining upon return (a third of the participants). This meant that some were presenting from homes or offices many time zones away – during the wee hours of the night or at the crack of dawn. Masks and disinfectant were ever-present for those of us attending in-person, as were Covid tests for those who needed them before departure. It was the first time in months that most of us attended an in-person meeting or had been on a plane or train. Our time

together at this breathtakingly beautiful venue was both exhilarating and surreal, with the unprecedented safety rituals for those of us in the room and the disembodied faces of our colleagues on screen, adding resonance to our discussions about the promise and possibility, the limitations and risk, of the new technologies and algorithms which are playing a larger and larger role in our academic lives and that of the institutions we are leading.

The power of the digital domain was strikingly clear. Discussions were lively, and the presence of our colleagues from around the globe, while remote and on-screen, added meaningfully to the dialogue. We did miss the ability to more fully interact with them at coffee breaks and over shared meals, but the urgency we all felt about the state of the world seemed to thaw the sometimes icy politeness that too often characterizes academic discourse and exchanges. Whether around the table, or between those of us at the table and on the screen, exchanges were often passionate, pointed and direct.

We were all keenly aware of the power and potential of our institutions. The basic research conducted at our universities over decades provided the foundation needed to quickly understand how Covid-19 functioned, how to track the scope and spread of the virus and its effects, and how to develop tests to diagnose infections. It was also critical to the development of treatments and vaccinations. Indeed, it was those vaccinations that gave us the courage and comfort to be in-person with our peers during the mid-June 2020 window when infection rates in North America and Europe were low and the delta variant was still not a major concern.

There was no need to justify or deconstruct whether our universities should function as the world's "fifth power". The need was crystal clear. It was also reassuring that the surveys conducted at the time of our meeting indicated that trust in science was on the upswing, reflecting the fact that we were rising to the challenge of the pandemic, demonstrating that we can turn our science into impact on short notice when it is most needed. But, as so clearly stated in the recommendations, the next set of pandemic-related challenges that lay before us, including vaccine hesitancy, supply chain disruptions and the contagion of misinformation may prove more vexing. There is much hard work ahead of us to be ready to meet the ongoing and foreseeable as well as the unexpected and unpredictable challenges that the future will surely bring.

As we listened to the excellent presentations that form the bases for the chapters in this volume, we were keenly aware of how the partnership between universities and government had grown in importance, with researchers and academics working in advisory roles on presidential or prime ministers' cabinets, helping them to craft their nation's evidence-based responses to the pandemic. Just a few weeks before we met, Dr Anthony Fauci, Director of the U.S. National Institute of Allergy and Infectious Diseases, was played by sex symbol Brad Pitt on Saturday Night Live, a popular U.S. comedy show,

illustrating the rock star status of top scientists who are regularly featured on the evening news. College graduates everywhere are learning that yes, mathematics and statistics course *are* relevant to policy and daily life decisions.

How can we use the momentum of this moment, where the importance and power of our universities is so obvious, to make progress on the recommendations that so clearly lay out what we must do to more fully realize our "fifth power" mission? And, just as importantly, how can we do so while maintaining a focus on equity, an issue that came up again and again in our discussions? The Covid pandemic has made it increasingly impossible to ignore the glaring economic and racial/ethnic inequities that exist within and between nations. For example, as we write this conclusion in the fall of 2021, there are ongoing, heated debates in both the healthcare community and in policy circles about the wisdom of offering booster shots (e.g. third shots of mRNA based vaccines) to citizens of wealthy nations given low vaccine availability and access in poorer nations (Jecker, 2021, September). And, even within the wealthier nations, like the United States, infection and death rates have been highest among low-income Black, Latinx, Native American and immigrant communities, due to greater co-morbidities, less access to health care and the fact they are more apt to have jobs that cannot be conducted remotely.

Covid-19 has not only revealed, but exacerbated inequities. Access to high quality remote education has varied between and within nations, with some countries lacking the ability to provide this to their youth at scale. And, even in countries where remote education has been available throughout their school systems, inequities are evident. Some children tune in via high-speed internet from a desk at home with a highly educated parent nearby to answer questions or provide motivation and support. Others live in homes with poor internet access and attend remote classes sitting on beds they share with several siblings. And countless secondary school and universities students have attended classes, when they can, on their phones outside coffee shops or stores with free wi-fi. There is little doubt that as we come out of the pandemic, we will have to find ways to bridge widening educational gaps between the haves and have-nots. This has implications for our own work within the academy, where large race, gender and economic gaps exist within the professorate, especially in the sciences and engineering. Representation matters. It has an impact on our learning environment and whether we are viewed as accessible and welcoming by all, especially first-generation students. It also has implications for developing more broad-based community trust in science and academic knowledge.

As university and societal leaders, we have hard work ahead of us in the coming years. And that work is critical. Our ability to effectively tackle not only future health crises, but also the impacts of climate change and the

growing gap between rich and poor individuals and nations depends upon the work, and the workforce, that our universities are producing. We must rise to the challenge, and we can best do so through collaborative work. Throughout the conference the weight of the world rested heavily on our shoulders, and there were moments when cynicism, pessimism and even despair were hard to avoid. Yet, as we learned more about the truly outstanding work taking place at each other's universities and we witnessed each other's resolve to move forward with a sense of true urgency, we were able to close our sessions with an optimism that was guarded but real.

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Recommendations

At the time of the 13th Glion Colloquium, the world experienced a pandemic of historic proportions, which became painfully clear from the fact that only part of the contributors could be physically present, whereas the others provided their contributions on-line. Unintentionally this illustrated that the world has entered an era in which communicating and exchanging ideas has reached the point that on-line is almost as good as physical presence. And precisely that marks one of the central challenges for the university in the near future: how to maintain its position and get heard in the public debate, when this is more and more moving towards the digital domain. During the colloquium, these and other developments were extensively discussed, focusing on four key topics.

ON HOW UNIVERSITIES COMMUNICATE

There is wide consensus among university leaders that more than ever there is a role for the modern university in communicating to and with society. More and more this is seen as a way to legitimize the university as a vital constituent of society and user of public funding. Primarily, this communication concerns the impact of research, emphasizing research that gives answers to the main societal challenges of today, such as the health and economic crisis of 2020, or the growing threat of climate change. More generally, this includes the communication of scientific outcomes so that experts are heard in the public debate, and research outcomes can be used to underpin major decisions in society.

Although most if not all universities will support this view, it is obvious that in particular communication regarding the outcomes of research is not always effective. Universities should be more alert in how to take care of knowledge dissemination, in particular in how to keep the public debate honest, and to prevent false truths from prevailing. First of all, that requires scientists to be better trained in how and when they disseminate knowledge. This should be timely, and well-considered in form and shape, and the content unambiguous in order to prevent distortion in the subsequent public debate. It is important that in the haste and enthusiasm to claim novel results, not too much is promised. In this context, careful considerations regarding uncertainties that are intrinsic to science should always be mentioned, and framed in a transparent and understandable way. In the second place, it requires universities to invest more into the interaction between universities and public. It pays to make use of trained personnel who really understand science, in order to arrive at timely and coherent communication. In the third place, universities should realize that it is not sufficient to communicate only the results, and leave it at that. When universities note that scientific truths are distorted in the public or political debate, they should actively seek to become more involved in finding ways to curtail the spread of false ideas or academic non-truths before they become widespread.

The past few years have shown that new forms of communication can be very powerful, a lesson reinforced by the pandemic. These include developing games, for instance, to train younger people to be critical and inquisitive instead of believing everything that is circulating in their social media bubble. Another would be for universities to partner to create authoritative websites on important topics of public interest, even to the extent that hotlines to experts are provided so that the public at large can verify statements almost immediately.

More than a mere task that needs to be done, it is recommended that universities recognize that communication to and with society is at the heart of the university. Without successful communication, the value of research falls substantially. Publication of scientific results is only part of the job: communication to and with society should be intensified and will require innovative ways and means in order to be heard and to keep a central position in society.

ON HOW CITIZENS PARTICIPATE IN RESEARCH

Communicating with society is not only about content, it is also about the participants. More and more citizens ask questions, demand answers and even want to participate in the research that universities are carrying out. This wish to participate in or have influence on research projects, ranges from patient organizations setting medical priorities, up to citizen science projects

harvesting and analysing millions of data, and amateurs who have shown that they can contribute to science by gathering biological data in the field.

In the context of making science more accessible to society, the Open Science movement has been important over the past five years, particularly so in Europe, although the scope of open science is much wider than communication. The policy papers of, for instance, the European Union mark ambitions ranging from open data and open source, up to open educational resources. Clearly embedded in this trend is the increased participation of citizens and organizations in setting the research agenda, and participating in research projects, mostly through data collection. It is clear that this is an important extension of the rather old-fashioned, one-directional way of communicating about research: it gives society a say in what universities are doing, thus legitimizing the public funding given to universities to carry out research. It also strengthens the ties between universities and society. In fact, it marks the very end of the classical ivory tower as far as that still exists.

Given its importance, the successful participation of citizens requires more thinking about successful ways, and better facilities and structures: here, best practices can be shared far more effectively than has been done so far. It is clear that, in the field of citizen science, good practices are already widely available, but implementing them should not be left only to enthusiastic staff members: university leaders should actively promote this, think about structures to help push this interaction forward, and think of new ways of nudging staff into action, for instance through giving them the time and even a bonus to set things into motion.

Also, on a higher level, the science agenda should be made more sensitive to demands from society, obviously without neglecting fundamental research: national science agendas focus more and more on complex societal challenges. Of course, this will help to legitimize the position of the university. The reverse could also be true: if the university neglects the demands from society, it loses influence. But, to arrive at adequate solutions for societal challenges, more inter- and multidisciplinary research is required. For this, at national levels, funding should be made available in order to be really successful, because traditional funding channels are mostly geared towards disciplinary research.

ON HOW UNIVERSITIES CONTRIBUTE TO EFFICIENT PUBLIC POLICY-MAKING

The Covid-19 pandemic clearly illustrated the crucial role research plays in solving large and complex societal challenges. One could say that never before have universities and research institutes better demonstrated the importance and power of fundamental and applied research by providing the necessary

vaccines adequately and incredibly fast. But, during the pandemic, the important role of science in policy-making also became very clear. On all levels scientific knowledge formed the basis for the many rules imposed on society to cope with the crisis, including severe restrictions on international traffic and mobility. The crisis also demonstrated the urgency of open and trusted channels between science and policy. In the future such a science-policy interface clearly needs better organizing in many ways. A prerequisite of successful policy-making is that universities speak with one voice and collaborate to find consensus both in agreeing on important scientific issues or solutions, and subsequently in transferring these conclusions coherently and in suitable form to the political domain. Crucial in this is that the public at large is continuously made aware of the fact uncertainty is intrinsic to science, and not a sign of weakness or a lack of knowledge.

It is important that universities create clear ideas about their role in policy-making other than transferring adequate and relevant knowledge. An effective science policy interface also requires a platform to facilitate the debate between scientists and parties involved in policy-making. Knowledge-informed policy-making is not a simple question of defining the needed knowledge, but even more of transforming the knowledge into usable bits and bytes. To this end, universities need to form arenas in which extensive debate is facilitated in order to become more effective.

An important question in this context is whether the university takes an active stand in the debate, or is only striving after activating knowledge in the context of politics. The latter means neutrality, the first would require further steps in forming and publishing opinions or judgements on public issues. Overall, it was felt during the colloquium that neutrality would be the most effective position, realizing that even then some developments need a clear public stand or even condemnation. But the issue clearly requires more thought since the circumstances might differ between countries and depend on issues, leading to variable responses of universities worldwide, ranging from providing a neutral platform to facilitate the debate, to being a more active participant in the debate. In all cases it requires the university to realize that it has become an important player in the public domain, both by providing knowledge and through actively seeking solutions for large societal challenges.

HOW UNIVERSITIES RAPIDLY BECOME A FIFTH POWER

From the previous sections it has become clear that the changing times require different positions from many institutions, and also from the university. Clearly, the university is no longer an ivory tower, and obviously,

the university is already playing a crucial role in society in educating young people and providing knowledge through basic research. It is also clear that the societal changes require novel ways in communicating this knowledge and creating impact.

But there is more to this than the simple observation that teaching and research are the primary roles that the university has to play. The so-called third mission, already clear from the various roles described in the previous paragraphs, has made the university part of a larger network in which industry, NGOs and governments all interact. And networks like these increasingly play a role in the international discourse even up to the level of diplomacy.

Over the past years, knowledge diplomacy has gained more and more in importance, and this trend will probably continue over the coming years. This is caused by the fact that multilateralism is eroding and the monopolar world of the past has rapidly changed into a complex multipolar world where traditional mechanisms of interaction between states are no longer as effective as before. In this context networks are rapidly gaining in importance, among those in which universities are effective. The reason behind this is that many universities provide ready-made international networks, and that talent and knowledge are powerful elements to build bridges and/or to gain influence. Whether they like it or not, and whether they are aware of it or not, universities are thus part and parcel of this new "web of networks" that plays an increasingly prominent role in international arenas.

Knowledge diplomacy ranges from simple student mobility programmes to complex science diplomacy as in the context of the One Belt One Road Initiative of the Chinese government. It is clear that universities should reflect deeply on their role therein, and certainly on the question of to which extent they want to be part of the system. More than ever universities should realize that knowledge diplomacy is becoming a powerful tool in global governance. Therefore, they should be more aware of why and how they are used by governments, and carefully consider to what extent their academic freedom is threatened by this or not.

OUTLOOK

Throughout the discussions during this colloquium, there was an uneasy background feeling, sometimes clearly expressed in the debate, which appeared to be related to the question whether the modern university has the appropriate structure to adequately respond to all the new challenges and changes in role patterns. Clearly, the present form of the university dates from its early conception and was mostly meant to accommodate teaching and later a growing research component. In modern times, it sometimes seems that research has become even more important than teaching. This is partly due to the rankings

that mostly highlight research. But also in reality disciplinary research is the dominant parameter that decides on the university structure resulting in faculties and schools.

It is clear that in the future more is required: the university as fifth power, communicating in the context of, and responding adequately to, enormous societal challenges. The university as a crucial part in the diplomacy network and as a powerful player in contributing to informed politics. And the university which is open to society, connected to citizens and in all aspects completely different from the ivory tower that still existed 50 years ago. That university might require new forms of organization, more interdisciplinary, more as open innovation space, more connected to society, and more open to the demands of the labour market. And yet, it is crucial to preserve the university as the place of unprogrammed, curiosity-driven, fundamental research. Combining all these functions in one organization is the central challenge for the future.

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This 13th volume recording the Glion Colloquiums provides a striking set of ideas concerning the **communication and exchange of research universities with society**. Its timely topic was chosen by the programme committee in 2019, before the outbreak of the pandemic. Eminent leaders of research universities around the globe present indispensable advice on how to improve the "relationship" of science with society, especially during a crisis. First, **about how universities communicate,** presuming that communication to and with society is at the heart of the university and increases the value of research considerably. Second, **how citizens participate in research** – examining the active promotion of citizen science, ways to help this communication forward and new approaches for motivating faculty and staff into action. In the third part, leaders **recommend how universities can contribute to efficient public policy-making**. Contributions discuss the important question whether the university takes an active stand in the debate, or is only striving to activate knowledge in the context of politics. In the fourth part, participants discuss **how universities become the fifth power**. Knowledge diplomacy is becoming a powerful tool, but universities should be more aware of why and how they are used by authorities, and carefully think about how their academic freedom can be imperilled.
For the colloquium, 20 leaders of renowned universities gathered in Glion-above-Montreux in Switzerland – and some online – for four days in June 2021 to **exchange** and **examine** the challenges facing society and how universities can respond in a more efficient way. Their discussions are now made available in this volume to students and researchers, to the worldwide academic community, to governments and the general public.

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