Collegium
Helveticum

Fellow Period 2016–2020

Digital Societies

ETH zürich

University of Zurich[UZH]

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Zürcher Hochschule der Künste
Zurich University of the Arts

Editorial

Exploring the present in a historical setting: in autumn 2016, seven newly appointed fellows began their work at ETH Zurich's Semper Observatory. Together with their teams and in close collaborations with the Collegiums's three associated fellows, they spent four years examining the conditions of digital transformation and the forms in which it has manifested. Through their work and as personalities, they left a profound mark on the Collegium and helped to maintain the institute's reputation for outstanding, original academic and artistic research. For this, they are sincerely thanked. And I would also like to thank the Collegium's staff and management team for their exceptional dedication even in turbulent times, including the Covid-19 pandemic.

This report offers insights into the projects completed during the 2016 – 2020 fellowship period, and the ideas and activities that grew out of them. The photographs inside the brochure have been taken by Andrea Helbling and Marc Latzel as part of a research project on digital infrastructures. They have been presented during one of the Collegium's exhibitions in its newly built art spaces. Over and above its activities in scientific and artistic research, this expansion of the Collegium's infrastructure underscores the Collegium's commitment to fostering transdisciplinary dialogue in new and innovative ways.

Dr Christian Ritter,
Director ad interim

Foreword – Per aspera ad astra

When I look back on the 2016–2020 fellowship period, and cast my gaze up at the Semper Observatory in which the Collegium is housed, this is the phrase that comes to mind, roughly translating as 'through adversity to the stars'.

It has been an exceptional fellowship period, which has now come to a highly satisfactory conclusion. Back in 2016, following preparatory work by the new director, Prof. Thomas Hengartner, and with the Zurich University of the Arts now on board as the Collegium's third partner institution, seven fellows set to work on the highly topical subject of Digital Societies. These seven fellows were Prof. Hannes Rickli (appointed by Zurich University of the Arts), Prof. Nikola Biller-Andorno, Prof. Monika Dommann, Prof. Mike Martin (appointed by the University of Zurich) and Prof. David Gugerli, Prof. Petros Koumoutsakos and Prof. Renate Schubert (appointed by ETH Zurich). The three associated fellows, Prof. Joachim Buhmann, Prof. Sara Fabrikant and Prof. Florent Thouvenin, proved themselves to be indispensable partners to the fellows right from the start.

In summer 2017, Thomas Hengartner fell ill, and died a little under a year later. He left some big shoes to fill, both as a human being and as a chairperson, leader and visionary thinker. Since the fellows' collaborative transdisciplinary projects were already well underway, with the research and publications all proceeding on schedule, it was decided not to look for a successor. Instead, Thomas's deputy, Dr Hartmut von Sass, was put in charge of the Collegium's operations. After Dr von Sass left to take a professorship at Humboldt University in Berlin, Dr Christian Ritter became interim director. A series of theme weeks and exhibitions took place and were well received.

The final year, 2020, was dominated by the coronavirus pandemic, which demanded new solutions. The opening of the Wired Nation exhibition at the end of one fellowship project was able to go ahead on time, despite the delayed completion of the exhibition rooms in the observatory, though visitors didn't get to enjoy mingling at a vernissage. Meanwhile, the conference Algorithmic Knowledge Production – Principles, Problems, Prospects, co-organised by several of the fellows, was a complete success in digital format.

The brilliant, tangible results of the 2016–2020 fellowship period in the form of publications and events are testament to the productive collaboration between academics and artists from myriad disciplines. The highly varied output ranges from monographs and edited volumes to reports for national and international organisations, from exhibitions to articles in prestigious academic journals, from software and hardware development to artistic works. On behalf of the board of trustees, I would like to thank the fellows, associated fellows, managers and staff of the Collegium for managing to bring the fellowship period to a highly successful conclusion despite all the misfortunes and twists of fate they had to contend with. A fantastic achievement: per aspera ad astra!

Prof. Dr. Dr. h. c. mult.
Sarah Springman, Rector of ETH Zurich,
President of the Board of Trustees

The Collegium Helveticum and its fellows

The mission of the Collegium Helveticum, Switzerland's only Institute for Advanced Studies, is to promote dialogue between various academic disciplines and the arts. It provides a platform for collaborative, transdisciplinary research projects and analysing their results.

As an institute for advanced studies (IAS), the Collegium Helveticum offers intellectual freedom and promotes scientific innovation beyond the paradigms of the academic disciplines and the mainstream of research funding. Alongside the transdisciplinary research of its fellows and other staff, the Collegium organises international events on fundamental issues in science and the arts in general, as well as on the current research topic of Digital Societies. In addition to the above, the Collegium Helveticum provides a platform for transdisciplinary research topics and associations, sometimes also in cooperation with other institutions and initiatives.

The Collegium Helveticum, a joint initiative of the University of Zurich, ETH Zurich and the Zurich University of the Arts, is a think-tank and laboratory for transdisciplinary research. It aims to provide a meeting place and forum for dialogue between the humanities, social sciences, physical sciences, technical sciences, medical science and the arts, thus responding to trends towards the dismantling of technical, cultural and scientific disciplinary boundaries, which, itself, requires a correspondingly scientific approach.

The Collegium Helveticum is the only IAS in Switzerland. Its tripartite sponsorship by a university of the arts,

a technical university and a general academic university is unique worldwide. With its transdisciplinary approach, the institution is well placed to reflect on complex processes, going far beyond our preconceived thought collectives and thinking styles. The Collegium Helveticum's core work involves the development and implementation of, and reflection on, collaborative, transdisciplinary research projects. The exchange with the Zurich research hub is also central to this, most notably comprising networking with and within the three sponsor institutions, with the international IAS network, and with non-university stakeholders in business, public administration, and the political and cultural spheres.

Fellow model 2004–2020

Seven fellows – three professors each from the University of Zurich and ETH Zurich, plus one professor from the Zurich University of the Arts – form the core membership of the Collegium Helveticum. During their four-year fellowship, the Collegium Helveticum's fellows continue to hold the professorships and other positions at their home universities. However, they are relieved of 20 percent of their workload in order to free up their schedules for research at the Collegium Helveticum.

This model of a 'long-term, part-time fellowship', which is unique in academia, allows researchers to benefit from intensive collaboration between the Collegium Helveticum and the Zurich research hub. In addition, the appointment of fellows for a minimum four-year period offers the best possible conditions for conducting successful transdisciplinary research projects.

The director and fellows nominate associate fellows – of which there are three in the current fellowship period – whose areas of expertise complement their own, who can contribute something to the fellowship projects, and who can reinforce national and international links.

History

The Collegium Helveticum was founded by ETH Zurich in 1997 as a forum for dialogue between academics, the aim of which was to promote mutual understanding between the natural and technical sciences, the humanities, and the social sciences. Until 2004, the Collegium Helveticum was organised as a small graduate college for young academics from the University of Zurich and ETH Zurich. The institute's scholarship students – selected on the basis of their interdisciplinary interests and the academic rigour of their research projects – would spend two semesters at the Collegium Helveticum. Meanwhile, world-renowned guests from the academic, literary and artistic spheres were invited to stay at the observatory for one semester each, thus serving to enrich the Collegium's multidisciplinary environment.

Since 2004, the Collegium Helveticum has been managed as a joint initiative of ETH Zurich and the University of Zurich. This also marked the introduction of the present structure of the institute, whereby five-year fellowships are offered to professors of the University of Zurich and ETH Zurich, who then work together to carry out research on an agreed topic. During the first fellowship period (2004–2009), researchers at the Collegium examined The Role of Emotions: Their Influence on Human Behaviour and the Establishment of Social Norms. The following fellowship period (2009–2016) was dedicated to research on Reproducibility, Prediction and Relevance. The current period (2016–2020) revolves around the topic of Digital Societies. In 2016, the Zurich University of the Arts

became the Collegium Helveticum's third sponsor institution.

The first director of the Collegium Helveticum was Professor Adolf Muschg. In 1998, his position was taken up by Professor Helga Nowotny, who held the post until she attained her emeritus professorship in 2002. Professor Peter Rieder then accepted the role of Director ad interim of the Collegium Helveticum until the end of September 2004. Professor Gerd Folkers was in charge of the Collegium from 2004 to 2015. From 2016 to 2018, the Collegium Helveticum was led by Professor Thomas Hengartner. After he passed away, Dr Hartmut von Sass stepped into the role of Director ad interim until the end of December 2019. Dr Christian Ritter has headed up the institution on an interim basis since January 2020.

Semper Observatory

The Collegium Helveticum is housed in the Semper Observatory. Located just a stone's throw away from the main buildings of the University of Zurich and ETH Zurich, this listed building has strong ties to mathematician and astronomer Rudolf Wolf (1816–1893) and architect Gottfried Semper (1803–1879), both of whom accepted professorships at the former Zurich Polytechnic in 1855. Wolf had the observatory built according to Semper's own designs and the building opened its doors in 1864. For more than 100 years, the observatory was a global centre of sunspot research. However, in the 20th century, the expanding city of Zurich and its increasing emissions soon threatened the observatory's formerly rural location, leading to its closure in 1980. Following the completion of extensive renovation work in 1997, the observatory was reopened as an institutional building of the Collegium Helveticum.

In autumn 2020, the Collegium Helveticum opened two new spaces equipped for exhibitions and performances at the Semper Observatory, both of which have been designed to meet the needs of artistic-scientific research and presentations.

The fellows

Prof. Dr Dr Nikola Biller-Andorno

Nikola Biller-Andorno is a full professor of biomedical ethics at the University of Zurich and runs the university's Institute for Biomedical Ethics and History of Medicine.

Born in Nuremberg, Germany, in 1971, she began her career with degrees in medicine and philosophy. After obtaining a PhD in both subjects and completing a post-doctoral fellowship at Harvard Medical School, she finished her post-doctoral studies in medical ethics at the University of Göttingen. She then spent two years at the World Health Organization in Geneva before going on to work at the Charité teaching hospital in Berlin.

Nikola Biller-Andorno has been working in Zurich since 2005. Her current research interests lie in narrative medicine and the effects of economisation on medical care. She is especially interested

in how the opportunities presented by digitalisation can be used to achieve adequate, patient-oriented healthcare.

Nikola Biller-Andorno is a member of the Swiss Academy of Medical Sciences. She is also Vice President of the University Hospital of Zurich's clinical ethics committee and a member of the Swiss National Science Foundation's National Research Council.

Prof. Dr Monika Dommann

Monika Dommann is a full professor of modern history at the University of Zurich.

Born in Walchwil, Switzerland, in 1966, Dommann completed her PhD at the University of Zurich. Among other things, she has conducted research and taught at the University of Basel, the International Research Institute for Cultural Technologies and Media Philosophy in Weimar, the German Historical Institute in Washington, the Max Planck Institute for the History of Science in Berlin, McGill University in Montreal, and the International Centre of Cultural Research in Vienna.

Her research interests include ties between the old and new world, the history of material cultures, the history of intellectual properties, the history of logistics and data centres, the history of the market and its margins, the history of audiovisual media, and the methodology and theory of history.

She is a member of Professor Roland Kuhn's psychotropic research group at the Münsterlingen Psychiatric Hospital (1946–1972), a member of the Konstanz University Press editorial board, a member of ETH Zurich and the University of Zurich's Center History of Knowledge, and a board member of the Swiss Society for Economic and Social History.

Prof. Dr David Gugerli

David Gugerli has been a full professor of the history of technology at ETH Zurich since 2001.

Born in 1961, David Gugerli studied history and literature before obtaining his PhD in history in 1987. He then went on to complete his post-doctoral studies at the University of Zurich in 1995 and became an assistant professor at ETH Zurich in 1997. He has been a visiting scholar at the Maison des Sciences de l'Homme in Paris (1988 and 1991), a visiting fellow at Stanford University (1992), a visiting scholar at El Colegio de México (1989–1993), a fellow at the Berlin Institute for Advanced Study (1993/94), a fellow at the International Centre of Cultural Research in Vienna (1994), and a professor at the National Autonomous University of Mexico (1996). He was a guest of the rector of the Berlin Institute for Advanced Study in 2006 and a senior fellow of the University of Constance's Zukunftskolleg in 2008/09. In 2014/15, he was a senior fellow at the Digital Cultures Research Lab at the Leuphana University of Lüneburg.

His research spans a wide range of subjects within the field of 19th and 20th-century history of science and

technology: the history of electrification, the cartographic mastery of the national territory, the visualisation of the human body and the development of the university of technology. His more recent work has included the history of computer-aided search processes and databases, and the knowledge-based economy of the reinsurance industry.

David Gugerli is a founding member of the Center of History Knowledge, which is sponsored by ETH Zurich and the University of Zurich. He was Head of ETH Zurich's Department of Humanities, Social and Political Sciences, a member of the institution's research commission and, from 2009 to 2016, the president of its strategy committee. Gugerli is also a member of the Turing Centre of ETH Zurich.

Prof. Dr Petros Koumoutsakos

Petros Koumoutsakos was a full professor of Computational Sciences at ETH Zurich from 2000 to 2020. Since autumn 2020, he has been Professor of Computing in Science and Engineering at Harvard University.

Born in 1963 in Gythio (Laconia) in Greece, Koumoutsakos studied naval architecture at the National Technical University of Athens in 1986 (diploma) and the University of Michigan in Ann Arbor, USA, in 1987 (master's degree). He completed his master's degree in aeronautics (1988) and his PhD in aeronautics and applied mathematics (1992) at the California Institute of Technology.

His research centres on the interface of computing and data science, with an emphasis on their applications in engineering and medicine.

Koumoutsakos founded the ETH Zurich Computational Laboratory (2000–2007) and is the Founding Director of the Zurich Graduate School in Computational Science. He has served as the Chair of the Scientific Steering Committee of the European High-Performance Computing Infrastructure and is currently serving as the Chair of its Access Committee. He is an elected Fellow of the American Society of Mechanical Engineers, the American Physical Society, and the Society for Industrial and Applied Mathematics. He was the recipient of the European Research Council's Advanced Investigator Grant and led the team that won the 2013 ACM Gordon Bell Prize in Supercomputing.

Prof. Dr Mike Martin

Mike Martin has been a full professor of gerontopsychology and gerontology at the University of Zurich since 2002.

Born in Mainz, Germany, in 1965, Martin studied psychology in Mainz and Georgia, USA, where he completed his master's degree. He earned his doctorate at the University of Mainz and completed his post-doctoral studies at the University of Heidelberg in 2001.

His research interests include the theoretical understanding of healthy ageing, empirical and longitudinal studies, and the provision of decision support systems to aid in the understanding of the

individual dynamics of healthy ageing in a real-world context. He typically uses multi disciplinary and participatory research approaches to develop semantic analyses integrating different levels and forms of information, thus facilitating the interpretation of individual health-related data.

He is involved in competence centres on gerontology, plasticity research, multi-morbidity and the dynamics of healthy ageing. He is also a member of the steering group of the «Platform Ageing Society» (Swiss Academies of Arts and Sciences) and is Chair of the University of Zurich's Senior University Zurich. Martin has contributed to recommendations on the ethics of new forms of data (OECD Global Science Forum), Big Data and health (Swiss Academy of Natural Sciences), and the World Health Organization's 2015 and 2020 World Reports on Ageing and Health.

Prof. Hannes Rickli

Hannes Rickli is a visual artist and has held a professorship at the Zurich University of the Arts since 2004. At the university's Institute for Contemporary Art Research, he launches and manages artistic research projects in the fields of art and science.

Born in Bern in 1959, Rickli studied photography, the theory of art and design, and media art in Zurich and Karlsruhe. From 1988 to 1994, he worked as a freelance photographer for various newspapers and magazines (including Neue Zürcher Zeitung, Das Magazin and Bilanz), and has staged visual art exhibitions in Switzerland and abroad since 1991. In 2004, he was awarded the Meret Oppenheim Prize from the Swiss Federal Office for Culture.

His teaching and research focus on the instrumental use of media and space, the materiality of the digital as well as media ecology. Research projects: Computer Signals: Art and Biology in the Age of Digital Experimentation (2012–2015 and 2017–2021) and Surplus: Videograms of Experimentation (2007–2009) (funded by the Swiss National Science Foundation). The results of his research are made available through exhibitions, book publications and conferences.

Prof. Dr Renate Schubert

Renate Schubert was a full professor of economics at ETH Zurich until 2020.

Schubert studied economics at the University of Mainz. She earned her doctorate at the University of Tübingen and pursued her post-doctoral studies at the Technical University of Darmstadt. After holding professorships at the University of Regensburg and the University of Tübingen, Schubert joined ETH Zurich in 1992. Between 1993 and 2006, Schubert headed the institution's Institute for Economic Research. In 2006, she founded the interdisciplinary Institute for Environmental Decisions at ETH Zurich, which she ran until 2014.

Her research interests focus on behavioural economics as applied to environmental and energy issues.

For many years, Schubert was a member of the decision-making bodies of the Swiss National Science Foundation and the German Research Foundation. From 2000 to 2013, Schubert was also a member of the German government's Advisory Council for Global Change, which she chaired between 2004 and 2008. From 2011 to 2019, she chaired the Supervisory Board of the Karlsruhe Institute of Technology. In addition, Renate Schubert has been a member and chair of several expert committees that have advised different governments. Since 2015, she has been the principal investigator in the Singapore ETH Centre's Future Resilience System and Cooling Singapore programmes in Singapore.

The associated fellows

Prof. Dr Joachim M. Buhmann

Joachim M. Buhmann has been a full professor of information science and engineering at ETH Zurich since 2003. He is Head of the Institute for Machine Learning in the Department of Computer Science. He was an associate fellow of the Collegium Helveticum from 2017 to 2020.

Buhmann studied physics at the Technical University of Munich, where he was awarded his PhD in 1988 for his thesis on artificial neural networks. Following research appointments at the University of Southern California and Lawrence Livermore National Laboratory, he became Professor of Applied Computer Science at the University of Bonn (1992–2003).

Buhmann's research interests cover the theory and applications of machine learning and artificial intelligence, as well as a wide variety of issues relating to information processing in the life sciences and in medicine, in particular. One key question in machine learning concerns how complex models and algorithms used in data analysis (Big Data) can be validated if they are estimated based on empirical observations. To answer this question, it is necessary to develop a thorough understanding of the concepts of statistical and algorithmic complexity and their interconnectedness.

Buhmann previously worked as Director of Studies (2008–2013) and Vice Rector for Study Programmes (2014–2017) at ETH Zurich. Since 2017, he has represented the field of data science on the Swiss National Science Foundation's National Research Council. The German Pattern Recognition Society (DAGM), which he chaired from 2009 to 2015, granted him honorary membership in 2017. In the same year, he was appointed a member of the Swiss Academy of Engineering Sciences (SATW). In 2020, he became a fellow of the International Association for Pattern Recognition (IAPR).

Prof. Dr Sara Irina Fabrikant

Sara Irina Fabrikant has been a full professor of geography at the University of Zurich since 2013, where she is in charge of the Department of Geography's Geographic Information Visualization and Analysis division. A former member of the Department of Geography's management, she was previously Head of the department (2014–2016) and Director of Education (2016–2018). Between 2018 and 2020, she was an associate fellow at the Collegium Helveticum.

From 1990 to 1996, Fabrikant studied geography, history and cartography at the University of Zurich and ETH Zurich. She obtained her PhD in geography at the University of Colorado in Boulder, USA, in 2000, where her research focused on geographic information (GI) science. In 1999, Fabrikant was appointed assistant professor of the Department of Geography at the University at Buffalo (State University of New York, USA). A year later, she moved to the University of California's Department of Geography in Santa Barbara, USA, where she taught and carried out research as an assistant professor of GI science and cartography from 2000 to 2005. In 2005, she became an associate professor at the University of Zurich's Department of Geography.

Fabrikant's research interests include geographic information visualisation, geovisual analytics, spatial cognition, the graphic design of user interfaces and their empirical evaluation with users, and dynamic cartography.

Alongside her research, teaching and work as Co-Director of the Digital Society Initiative, she is a member of the Swiss Science Council and a number of international scientific committees. She was Vice President of the International Cartographic Association from 2011 to 2015. Aspects of gender and diversity in a digital knowledge society in general, and in the education sector in particular, are especially important issues for Sara Irina Fabrikant.

Prof. Dr Florent Thouvenin

Florent Thouvenin is an associate professor of information and communications law at the University of Zurich and was an associate fellow of the Collegium Helveticum from 2017 to 2020.

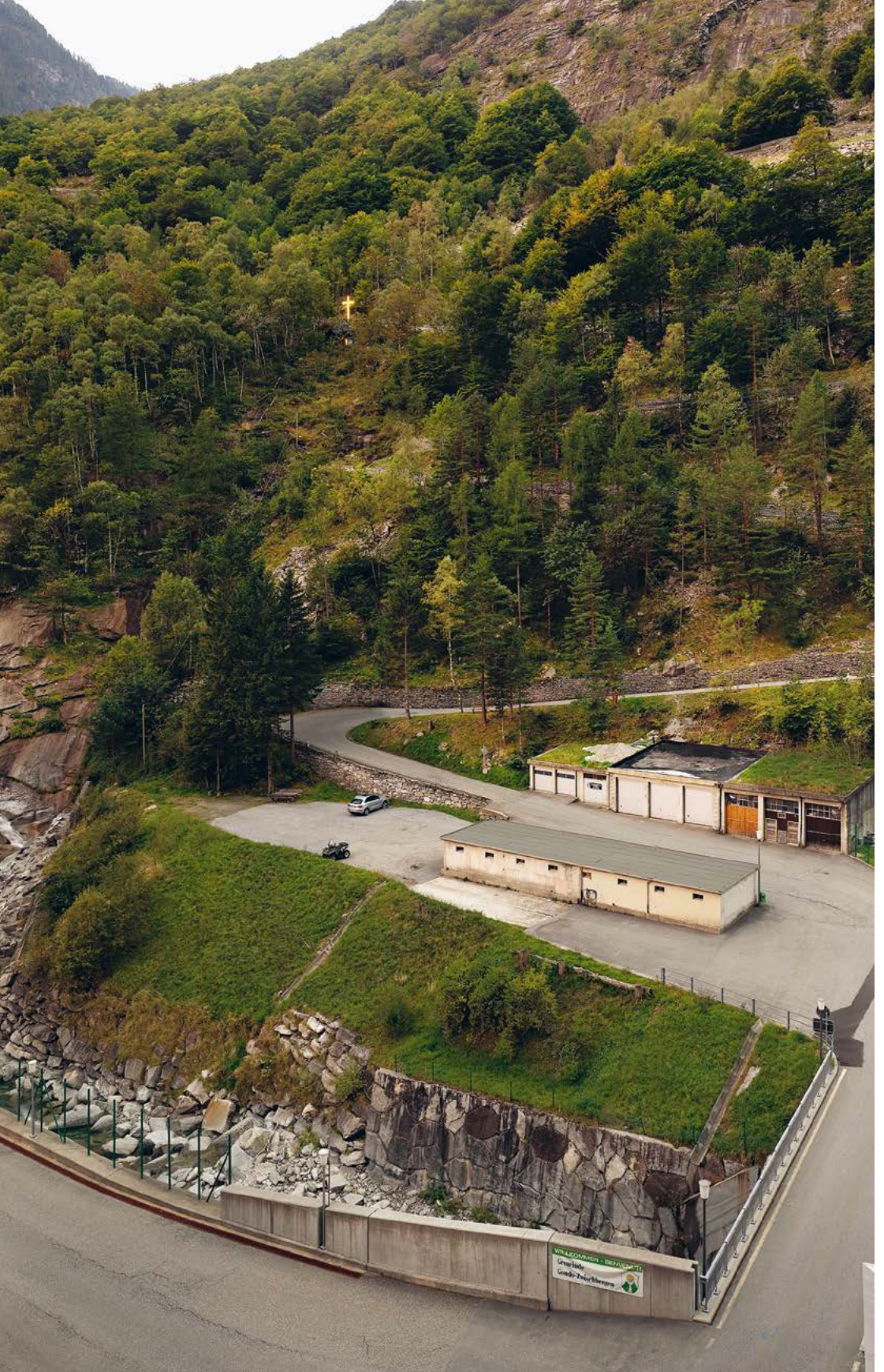
Born in Zurich in 1975, Florent Thouvenin completed his undergraduate, PhD and post-doctoral studies at the University of Zurich. He was a research

assistant at ETH Zurich and the University of Zurich, practised law at a Zurich corporate law firm, and was a senior research fellow in a research project at the University of Zurich, as well as an assistant professor at the University of St. Gallen.

His research is currently centred on copyright and data protection law. The question at the forefront of his research is whether and how our data protection laws must be reimagined in order to protect the private lives of data subjects while permitting the widest possible use of their data. His other research projects examine the legal implications of the challenges posed by AI in conjunction with exclusive rights and access to data, and the growing personalisation of advertising, contracts and pricing.

Among other things, Florent Thouvenin is Chair of the Center for Information Technology, Society and Law's Steering Committee, Director of the University of Zurich's Digital Society Initiative, and a managing director and board member of the Swiss Forum for Communications Law.

Photographs by Andrea Helbling, Arazebra, from the fellowship project Digital Infrastructures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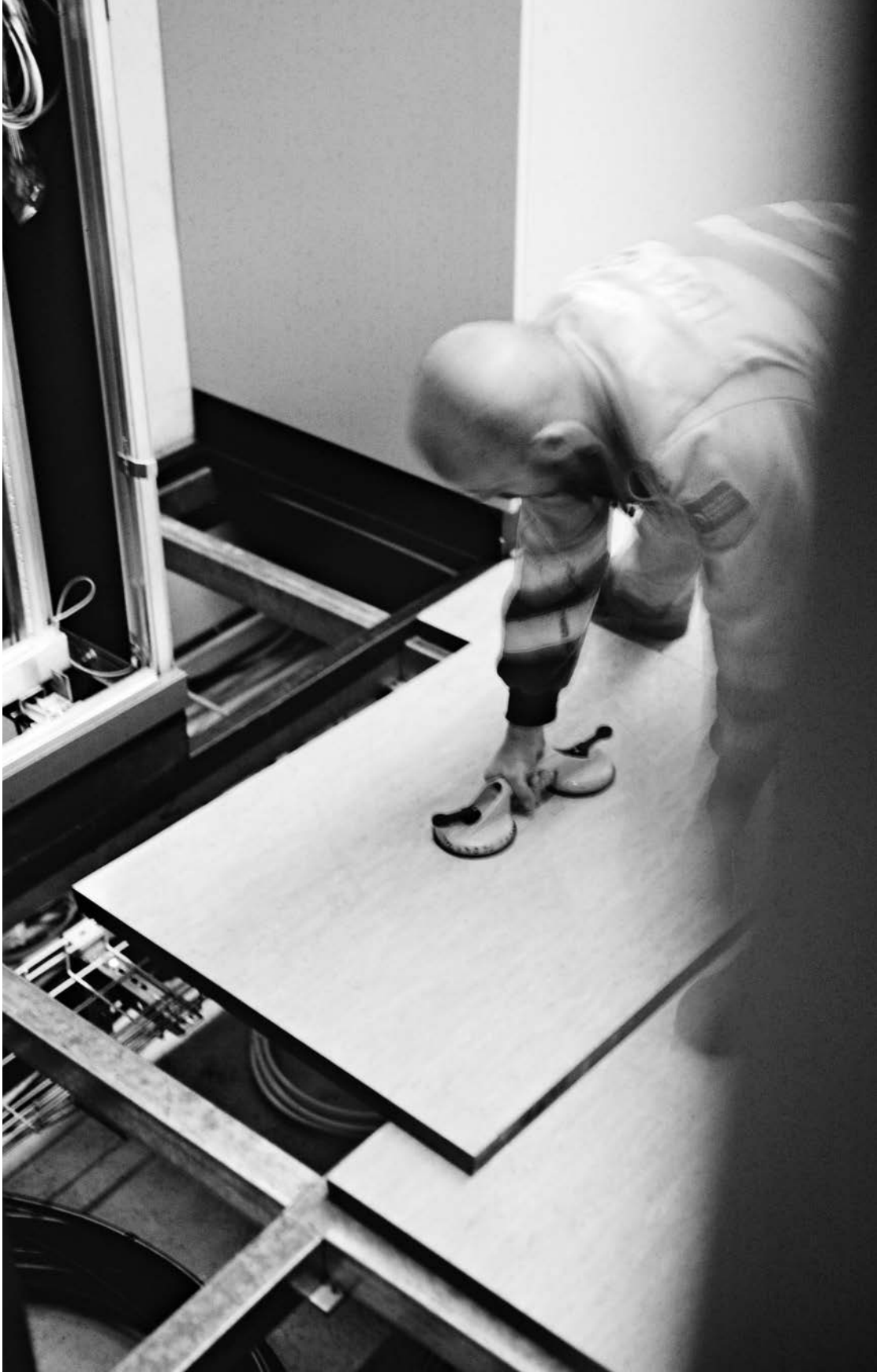


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A laboratory for transdisciplinarity

At the Collegium Helveticum, transdisciplinarity is not only a matter of method, but an object of research in its own right.

The Collegium Helveticum views itself as a laboratory for transdisciplinary research. According to its mission statement, its central purpose is to promote dialogue between the humanities, social sciences, physical sciences, engineering, medicine and the arts. This mission dates back to its founding in 1997. The only thing that has changed in the intervening decades has been the slightly greater emphasis placed on the arts since Zurich University of the Arts came on board as the Collegium's third partner institution, alongside the University of Zurich and ETH Zurich.

As well as encouraging research projects based on a transdisciplinary approach, the Collegium also hosts events that reflect on the topic of transdisciplinarity. This is underpinned by an awareness that few academic concepts in recent years have had a more ambivalent history than transdisciplinarity, which can refer to a whole host of very different theories and methods.

The Collegium Helveticum also takes transdisciplinary research itself as an object of research. Studies from the current fellowship period, on the topic of *Digital Societies*, have frequently addressed the challenges of transdisciplinarity: how should transdisciplinary studies be designed? How can we ensure that the centrifugal forces of individual disciplines do not undermine attempts to collaborate in new ways? What insights can we gain from transdisciplinary approaches? Are transdisciplinary research methods essential to identifying and solving certain key questions? And what implications does transdisciplinarity have for the disciplinarity of individual academic disciplines? Do transdisciplinary collaborations mutually increase productivity? Or, on the contrary, do they foster division and rivalry?

“Research is unfolding again”

A research project exemplifying the Collegium Helveticum’s transdisciplinary approach: historian Monika Dommann and artist Hannes Rickli talk to Barbara Bleisch about the project Digital Infra-structures and transdisciplinary ways of working.

Barbara Bleisch: Many people talk about transdisciplinarity, but you live and breathe it in your joint projects. You travelled to Gondo, for instance, a mountain village in the Valais that achieved a tragic infamy after a third of it was destroyed by a landslide in 2000. However, you were interested in Gondo for other reasons.

Hannes Rickli: Gondo was on my radar because of a recent newspaper article. It reported on a 'Bitcoin mine' that had been set up there, partly because Gondo has very cheap electricity prices. It's important to understand that Gondo was once also home to a gold mine. The village won me over as a nexus between gold mining, electricity and new forms of money – and thus, ultimately, of digitalisation.

"This is what research is all about: an open process. It is never finished."

Monika Dommann

What does a historian look for in a place where Bitcoin mines are in operation?

Monika Dommann: What we did in Gondo is what historians usually say: 'dig where you stand'! We took a tour and had the entire landscape and emerging infrastructure shown to us. We talked to people and after these discussions we dug deep into history. In doing so, we not only removed the layers of the last ten years – including the landslide and the Bitcoin mine – but also went deep into the 19th century, when water management began in the Valais, the traces of which still shape the village's economy, society and community today.

As a historian you depend on sources. Most historians bury themselves in archives for this purpose. You, on the other hand, talk to contemporary witnesses on site, a process you also document in your book. Those who tell stories always adopt a personal view of reality. But as a historian, you presumably want to know what really happened?

Dommann: According to Reinhart Koselleck, historians mustn't claim anything that's not stated in their sources. That's the number one rule. But especially in the case of Gondo, for example, this gets you nowhere. After having conversations with people, we actually went to the archives, to the libraries, to the media report repositories. We noticed that many stories are circulating – stories that are always similar and reach far into the past, back to the gold rush in the 19th century. The picture thus became more and more complete and consolidated. After two years of 'excavation work' in people's stories and in the archives, our image of this village was entirely different to the one we had in the beginning. This is what research is all about: an open process. It is never finished. What I've explicitly learnt – and what I've known for quite some time as a historian – is that supposedly 'objective' media reports are part of these narratives, and that we therefore have to approach them with a very critical eye.

In this context, a quote comes to mind from the Basel historian Jacob Burckhardt, who had an ambivalent relationship to history: "We would dear-


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ly love to know the wave that is carrying us over the ocean, but we are that wave". We would like to understand our own contemporary history, while at the same time being part and parcel of that history. Do you share this view?

Dommann: The metaphor of the wave is beautiful. It's important to know or think about your own point of view and interest in knowledge. The image of the wave is often used in history. The French historian Fernand Braudel coined the image of the foam of the wave. The foam corresponds to visible events, such as a press release. Braudel emphasised the need to investigate the forces that set the wave in motion in the first place. You will then encounter the social and economic forces at work. This is precisely what we've done. We've removed sediments down to the 19th century and have thus unearthed the history of digitalisation in this area.

Hannes Rickli is a visual artist and professor at Zurich University of the Arts.

You've mentioned digging several times. You, Mr Rickli, are a photographer – and you have dug and dug in different ways throughout your career: as a newspaper reporter, as an artist, and now as a scientist. As a reporter you show the world as it is, and as an artist you analyse and interpret it. Are there always different approaches to reality for you as a photographer?

Rickli: As a reporter, what interests me is what is depicted on the surface, what can be read as a symbol. However, when I'm on the road as an artist, I try to find an approach that permits a glimpse beneath the surface, so to speak. At the same time, this means that this approach has to be prepared, either technically or through some kind of operation. In this sense these are quite different approaches.

What did you see in Gondo while occupying these different roles as a reporter and an artist?

Rickli: On the surface, this blockchain mine was visible, built in a garage rented by the 'miners'. It's interesting to note that this garage previously belonged to a haulier who used it to maintain his trucks, so the connection between Gondo as a home to 'beasts of burden' – a customs office – and Gondo as a money-making site was already apparent. And all this in a single garage. Digitality begins in the garage. A concrete and emblematic image.

Dommann: Of course, since the invention of the internet, the garage has become a symbol of digitalisation! In Silicon Valley, the people associated with Steve Jobs have all tinkered in their garages.

Rickli: Innovation often comes from hobbyists – from these young, crazy kids. We also met tinkerers like this in Gondo: gamers who dream of striking gold. This

garage and these people can, of course, be captured on film, but at the same time you need another medium to complete the story.

Monika Dommann is professor of modern history at the University of Zurich.

Dommann: It's interesting that image policy also plays a decisive role in digitalisation. We've often discussed the fact that much takes place beneath the visible surface – and perhaps even the most important things. Huge technical installations are being created in secret, as it were, some of which are not public and which feed the need for images of these digital infrastructures. Media that report on digitalisation processes are looking for precisely these images to make the incomprehensible comprehensible – and with these crazy images they, themselves, become a source of hype. In this wave, to continue the previous metaphor, images are generated which in turn become icons of digitalisation. The garage is just such an image.

It was therefore no surprise that we weren't alone in Gondo. We even met journalists from Wired Magazine, the American Silicon Valley digitalisation magazine. People travel to Gondo from all over the world to take similar pictures. And we discovered that our desire to travel to Gondo was, in turn, fed by these pictures. Ultimately, however, our interest was a scientific one, namely to peer beneath these surfaces and the images that attracted us, but we perhaps also got a bit carried away with them.

Why do you say "carried away"?

Dommann: Because, of course, we also became part of a story in which a small village is becoming a new hub of digitalisation. It's an attractive story, because digitalisation is so incomprehensible – and you would never expect to encounter such progress in the countryside in an almost extinct village. I say "carried away" because we were naturally fascinated by the stories we were told. And these stories were not false; they are actually very true. If you're familiar with the history of technology, they often mark the birth of technological advances – they're stories that tell of a future and new beginnings. But especially in times of seismic change, when in some areas no stone is left unturned and when existing technologies or business models are utterly destroyed (in the banking world this is called disruption), many initiatives and ideas also come to nothing and fade away more or less without a sound.

Together you're exploring the genesis and images of digitalisation – but digitalisation is also changing your work. For you, Mr Rickli, digitalisation has also brought complications. Originally, you were primarily interested in 'waste' – the image material that wasn't used – for instance in laboratories where you collected the material that was discarded.

“Transdisciplinary work only becomes productive when it produces conflict.”

Hannes Rickli

This ‘waste’ contained the most interesting stories for you. With digitalisation, this image waste no longer exists, because images are already being embellished, filtered and improved as the photos are taken. What do you work with now?

Rickli: Waste is the hollow form of what constitutes the object in certain arts – and this is where the science begins for me. The waste product offers the possibility of reconstructing what the waste product is disposing of, so to speak. But in the digital age, this waste is now being erased. You could reconstruct it on hard disks like a computer forensic specialist, but that’s not the method that interests me. I try to make waste products tangible in a sensory manner. As part of the Wired Nation exhibition (October to December 2020 at the Collegium Helveticum), for instance, we observed the computing processes in a supercomputer by listening to them. In our own way, we tried to bring out the physical materiality of the digital.

To what end?

Rickli: Primarily, actually, to make the process of digital work tangible at all. When calculating weather models from Meteo Swiss, for example, enormous amounts of data are processed every day, which we then consume as weather forecasts. We are never aware of how much energy is consumed and which global networks are necessary to generate this data.

In the wake of the pandemic, we may become newly aware of the opportunities offered by digitalisation. For example, a tracing app is designed to help isolate sources of infection as quickly as possible. Enormous amounts of data are being exchanged globally to help us understand the virus better. How do you assess the risks and opportunities of digitalisation?

Dommann: There’s currently an interesting conflict between science and society. Society has a need for the ultimate scientific truth. During the pandemic, we were able to observe in real time that there is no such thing as truth, but rather different truths, some of which are only preliminary findings – different truths from the perspective of virologists, epidemiologists, economists, sociologists and so on. To this day, the perception is that scientists disagree. But the fact that scientists have argued and continue to argue is good news to me. If they hadn’t argued, I would have been worried. Especially in times of crisis, arguments and controversy are a good thing. What I find impressive, even intoxicating, about the last few months is that research can be observed in real time. To get back to your question, to understand data as an objective answer would, of course, result in misunderstanding. Data requires interpretation. And interpretation is a process of negotiation and dispute, of permanent falsification. And the public also argues. And even though it’s very annoying for us scientists, these arguments are a sign of good science.

We talk about the ‘age of digitalisation’. In your opinion, are we still at the beginning of this age, in the middle of it, or almost at the end? Could you

even say that digitalisation is already so much a part of our way of life that we no longer feel we belong to an 'age of digitisation'?

Rickli: I see digitalisation as a process. I don't know when it started or when it will end. But you can feel that there are leaps forward. Corona certainly is and was one such leap. We had to switch to online teaching at the Zurich University of the Arts – while our students, who usually work with concrete materials, could suddenly only communicate digitally. It was a strange shift, but also an interesting one. And it worked! I wonder whether and how we'll return to the old teaching formats, or whether we'll use a hybrid format in the future?

Dommann: I can agree with that. Digitalisation has a long history. It actually began in metric thinking, in thinking in numbers. Of course, World War II changed a great deal; military interests led to sizeable investments and produced concentrated computing power, and huge data centres became ever-shrinking computers. Alongside the historical evolution of equipment, there's also a history of discourse surrounding our digital revolutions. This is familiar to me from other technological leaps; technology has always been categorised and located in relation to people. As a historian, I have the luxury of observing these processes from a distance – with a certain lack of excitement. Nevertheless, I'm always fascinated by the extent to which the development of new technologies also shapes our perception of the world.

Rickli: I'm seeing two movements at the moment, one of which is moving towards virtuality. More and more of our world is being disembodied. At the same time, digitalisation has physical foundations and effects. This can be nicely illustrated with the Covid-19 app. It works via national data streams that flow into global network infrastructures – but it reacts to physical contact between individuals. These entanglements really touch me as an artist.

In what way?

Rickli: Data is stored in data centres, in buildings made of concrete and steel, which are usually located in some far-flung place for reasons of security and electricity prices. As users and those who benefit from easily accessible data flows, the data reaches us wirelessly. We have no idea what massive infrastructures are required to produce and transfer it. Thousands of kilometres of submarine and terrestrial cables or earth-orbital satellites are required worldwide, for example, and their installation and maintenance usually rely on fossil fuels. I would argue that this gap between us and the environment – I call it the 'aesthetic gap', because human perception is suspended here – is one element of our digital immaturity.

Finally, let's talk about your transdisciplinary approach. Academic quality usually refers to the deepening of a discipline, not an understanding of its breadth – at least, only the former is typically honoured at universities. In your view, what are the advantages of transdisciplinary work and where do they produce conflict?

Rickli: Transdisciplinary work only becomes productive when it produces conflict. Only then do you become aware of other perspectives on the same subject. As a photographer I know this very well. A single image is the result of a huge process. As a photographer, I decide on the moment, the location and so on in which the image is created. Then comes the editorial task of selecting the image and

embedding it in a story. In the end, the individual image leaves no clues to this process. What's really interesting about this transdisciplinary work is the way the subject is extracted by taking different perspectives.

Barbara Bleisch is a philosopher and presenter of the TV show *Sternstunde Philosophie* on SRF. From 2017 to 2019, she was a visiting fellow at the Collegium Helveticum.

Dommann: The scientific division of labour is an invention of the early modern age. Science is becoming increasingly multidisciplinary, and a growing number of specialists are developing who work using different methods and instruments. At the end of the process, an almost romantic longing emerged in the 1980s to reunite the disciplines in what was called 'interdisciplinarity' – as if it were possible to converge again on a perspective akin to that of Leonardo da Vinci …

Like universal scholars who survey the entire world, like Aristotle.

Dommann: Yes, how they used to tap into the whole, break down disciplinary boundaries and adopt new perspectives, ultimately in order to see more, or rather the bigger picture. But that's a romantic image that's doomed to failure. Today, science only works if you're specialised – if you have a specific interest and specific instruments. For me, this is the first requirement. The second requirement is that you reflect your point of view and interests, but also the limits of your own discipline. In other words, I think that you need disciplinary training to be able to work in a transdisciplinary manner. Otherwise, you'll achieve nothing productive – because there's no friction between different points of view.

In art, transdisciplinarity has often been used to create entirely new art forms, which, in turn, have fed back into the individual disciplines. This can be seen in IT developments, for instance, whose origins – in a kind of retroactivity – lie in the gaming industry. Ms Dommann, is it possible to create something new in this way in the humanities?

Dommann: Yes, definitely! History is an old, established and somewhat slow-moving discipline. In the course of the last 170 years, it has developed an unagitated, very precise methodology, which is still more or less shared by all historians today. The disadvantage of this is that sluggish disciplines need external stimuli. It was external stimuli that drove history forward: geographers, sociologists and economists, and then, after 1980, cultural anthropologists, philosophers and myriad border crossers, who were often not trained as historians and therefore looked at history through different eyes.

However, this act of striking out in new directions contradicts what often happens in scientific policy, with the launch of large research fields virtually by bureaucratic decree. The most interest-

“The most interesting transdisciplinary work is usually not produced top down, but bottom up.”

Monika Dommann

ing transdisciplinary work is usually not produced top down, but bottom up, and often at the boundaries between disciplines, where researchers are interested in one other and willing to work together, even when there are conflicts. Our project was not only transdisciplinary, but also intergenerational. That was new for me, too. Our book brings together papers from a range of academics, from bachelor students to professors. That required a lot of work and a lot of understanding of which standards apply. This was a new, wonderful experience for me. However, it has to be said that we can afford to do transdisciplinary research today, because we’ve already established our careers. Our younger colleagues are still expected to advance their academic careers. And this is still mostly done on a strictly disciplinary basis. As I said, it’s not exclusively a bad thing to develop a thorough methodology and to find your own point of view.

Rickli: Contemporary art is currently associated with a wide variety of reference fields, such as natural engineering, social sciences, the humanities, VR and AI technology. Its media have also become fluid. Painting, for example, is merging with digital image media from the internet. At the same time, I notice that my students want to locate themselves. What is painting today, how does it relate to analogue and digital image techniques like photography or renderings? To what extent is it legitimate as an artist to use ethnographic methods in research without having studied them and their context in depth? The need of our students tends to steer them towards many non-artistic fields during their education, and usually leads them back to a complicated question: which media constellation best allows them aesthetically to communicate their chosen subject area and its contents? To judge this requires – and here I agree with Monika Dommann – experience that goes far beyond an institutional education. That is to say that inter- or transdisciplinarity cannot be taught or learned, but develops on the basis of experience.

Editing: Barbara Bleisch und Martin Schmid
Photos: Andrea Ganz

Selected events and publications

Transdisciplinarity is not only embraced in the research of the fellows, associate fellows and staff of the Collegium Helveticum; the institute of advanced studies also seeks to mirror this topic in its public events programme. Furthermore, it continues to offer a transdisciplinary platform for tackling complex issues affecting our society. The discussion surrounding transdisciplinarity is also reflected in the Collegium Helveticum's publishing activities.

Selected events

Lecture *Die Ordnung des Wissens. Von der Disziplinarität zur Transdisziplinarität und zurück*. Speaker: Jürgen Mittelstrass (Universität Konstanz). (2016)

Conference *Not only Between, but even Beyond. Oder: Transdisziplinarität – eine Bestandsaufnahme.* Speakers: Sabine Maasen (Technical University of Munich), Andrea Braidt (Academy of fine Arts Vienna), Elisabeth Bronfen (University of Zurich), David A. Edwards (Harvard University), Hans-Jörg Rheinberger (Max Planck Institute for the History of Science), Michal Linal (Israel Institute for Advanced Studies, Jerusalem), Florian Dombois (ZHdK). (2016)

Conference *Zusammenarbeit(en). Praktiken der Koordination, Kooperation und Repräsentation in kollaborativen Prozessen*. Various speakers. (In cooperation with the Department of Social Anthropology and Cultural Studies of the University of Zurich) (2017)

Lecture *Towards a High Trust Culture of Creativity in European Universities.* Speaker: Wilhelm Krull (Volkswagenstiftung). (2017)

Panel discussion *Wie viel Geisteswissenschaft braucht die Gesellschaft?* With: Fathi Derder (Swiss National Council), Lino Guzzella (ETH Zurich), Walter Leimgruber (University of Basel), Min Li Marti (Swiss National Council). (In cooperation with the Geschichtskontor of the University of Zurich and the *NZZ*) (2017)

Panel discussion *Die Stunde der Wissenschaft? Policy Making und Transdisziplinarität in der Pandemie.* With: Helga Nowotny (former president of the European Research Council), Matthias Egger (former president of the National COVID-19 Science Task Force; president of the National Research Council of the SNSF), Monika Dommann (Fellow, University of Zurich), Mike Martin (Fellow, University of Zurich), Renate Schubert (Fellow, ETH Zurich). (2017)

Publications

Holfelder, Ute; Schönberger, Klaus; Hengartner, Thomas; Schenker, Christoph (Eds.): *Kunst und Ethnografie – zwischen Ko-Operation und Ko-Produktion? Anziehung – Abstossung – Verwicklung: Epistemische und methodologische Perspektiven.* Zurich: Chronos 2018.

Hartmut von Sass (ed.): *Between/Beyond/Hybrid. New Essays on Transdisciplinarity.* Zurich: Diaphanes 2019.

Groth, Stefan; Ritter, Christian (Eds.): *Zusammen arbeiten. Praktiken der Koordination und Kooperation in kollaborativen Prozessen.* Bielefeld: Transcript 2019.

Photographs by Marc Latzel, from the fellowship project Digital Infrastructures


Erste Hilfe
DÄTWYLER


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Digital Societies

Remote learning, videoconferencing, smartphone address books … the pandemic has very visibly accelerated the digital revolution in our public, private and professional lives. Even family get-togethers, religious services, drinks with friends and political summits now take place online.

Computer-aided interaction is nothing new, whether in business, culture, government or public discourse. The pandemic has made it even more attractive, even more indispensable, an unrivalled way of traversing distances while keeping our distance.

Back in 2016 (that is to say, long before the pandemic), the Collegium Helveticum selected Digital Societies as the focal topic for the 2016–2020 fellowship period. Digital technology has become a ubiquitous part of our day-to-day lives, defining the horizons of our imagination, action, knowledge, values and perspectives. Digitalisation opens up new ways of utilising knowledge, ideas and resources, as well as new possibilities for scientific research: Big Data, the digital human, citizenship science projects. But it also poses major challenges in terms of legal and ethical issues, the impact on political cultures and our increasing reliance on algorithms to make predictions and decisions.

The fellows, associated fellows and staff of the Collegium Helveticum spent four years investigating these topics. Their work included studies on how to measure the uncertainty of predictions based on computer simulations of complex systems and how debates on computer-aided autonomy can be interpreted as moments of socio-technical self-affirmation, based on topics such as the history of the Swiss federal administration, the evolution of digital federalism, algorithmic knowledge production and high-performance computing. There were also studies on the possibilities of automated semantic analysis of measurable everyday activities and contexts, and on ways in which digital technology can support patients' decision-making processes. One recurring focus was on the topic of privacy: for instance, a series of empirical studies was conducted looking at individuals' paradoxical relationship to data in terms of purchasing and travel habits, social media and individual health. One fellowship project on the past and present of digital infrastructures explored the material environments of digital devices and the aesthetic, economic and social processes associated with them. Supplementing the fellowship projects, the Collegium held theme weeks on Reflecting Privacy (2017), Algorithms and Their Use (2018) and State – Democracy – Digitalisation (2018, timed to coincide with the year of the Swiss parliamentary elections).

The Collegium made further contributions to public debate on the digital transformation with the exhibitions Privacy – Protected, Shared, Sold (2019/2020) and Wired Nation – Landscape, Architecture, Infrastructure (2020).

Fellowship projects

Within the scope of the overarching topic of a fellowship period, the Collegium Helveticum allows its fellows to freely choose the subjects and formats of their research projects. These projects are developed following a bottom-up approach, and are based on the principle of involving fellows from a variety of academic and artistic disciplines. In the 2016–2020 fellowship period, a total of five such projects were launched.

Thinking + Computers + Data = Computing

Computer-automated data processing is one of our most potent instruments for advancing science and engineering today. Big Data is everywhere and permeates practically all areas of our lives. However, we need to question how much of the data we send, receive and process every day contains useful, meaningful information. In this context, a general objective of this project is to better understand the opportunities and limitations of automated data processing in understanding and predicting the detailed behaviour of systems in nature and society. Within this scope, it is important to explore the different causal explanations and their implications across disciplines.

Another key area of research on data processing is the link between data-driven vs. theory-driven approaches. We examined this link in relation to the problem of how to assess the uncertainty of predictions based on the computer simulations of complex systems. The trifecta of complexity, uncertainty and prediction provides fertile ground for transdisciplinary studies in the natural sciences, social sciences and the humanities. Lessons learned in these areas helped us to explore whether it is suitable to tackle political and economic questions in a similar fashion.

Essentially, this project critically examined to what extent computer-automated data processing entails not only opportunities, but also risks and unintended consequences. In seeking answers to this question, the thesis that auto-

mation cannot replace our imagination and creativity in the foreseeable future was also investigated.

Team
- Petros Koumoutsakos (lead)
- Georgios Arampatzis
- Harald Atmanspacher
- Phyllis Barth
- Nikola Biller-Andorno
- Federico Massini
- Renate Schubert
- Pantelis Rafail Vlachas

Selected events
Lecture *Computing . Data .. Science ... Society: On Connecting the Dots.* Speaker: P. Koumoutsakos (Fellow, ETH Zurich). (2017)

Workshop *After Digital? Emerging Computing Paradigms.* (2017)

Symposium *Smart Cities – Beyond the Standard Model.* With: R. Cowley (King's College London), E. Gordon (Emerson College Boston), L. Hovestadt (ETH Zurich), J. Portugali (Tel Aviv University), G. Ziemer (HafenCity University Hamburg). (2018)

Lecture *Trolls, Bots, Social Media and Protests: Race and Democracy in the Age of Technology.* Speaker: L. Wright Rigueur (Harvard University). (2018)

Workshop *Algorithms for Health and Health Research.* (2018)

Lecture *Big Data and Spurious Correlations.* Speaker: C. S. Calude (University of Auckland). (2019)

Selected publications
G. Arampatzis, D. Wälchli, P. Angelikopoulos, S. Wu, P. Hadjidoukas, P. Koumoutsakos: *Langevin Diffusion for Population Based Sampling with an Application in Bayesian Inference for Pharmacodynamics.* In: SIAM Journal on Scientific Computing (2018), 40 (3):B788–B811.

P. R. Vlachas, W. Byeon, Z. Y. Wan, T. P. Sapsis, P. Koumoutsakos: *Data-driven Forecasting of High-dimensional Chaotic Systems with Long Short-term Memory Networks.* In: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Science (2018), 474:20170844.

Z. Y. Wan, P. R. Vlachas, P. Koumoutsakos, T. P. Sapsis: *Data-assisted Reduced-order Modeling of Extreme Events in Complex Dynamical Systems.* In: PLoS ONE (2018), 13 (5):1–22.

W. Byeon, M. Domínguez-Rodrigo, G. Arampatzis, E. Baquedano, J. Yravedra, M. A. Maté-González, P. Koumoutsakos: *Automated Identification and Deep Classification of Cut Marks on Bones and its Paleoanthropological Implications.* In: Journal of Computational Science (2019), 32:36–43.

J. Zavadlav, G. Arampatzis, P. Koumoutsakos: *Bayesian Selection for Coarse-grained Models of Liquid Water.* In: Scientific Reports (2019), 9:99.

J. Lipková, G. Arampatzis, P. Chatelain, B. Menze, P. Koumoutsakos: *S-leaping: An Adaptive, Accelerated Stochastic Simulation Algorithm, Bridging t-leaping and r-leaping.* In: Bulletin of Mathematical Biology (2019), 81:3074–3096.

Digital support for decisions in healthcare

Patient orientation is a quality dimension that has become increasingly important in modern medicine. At the same time, it is known that in a fragmented, highly specialised medical sector operating under the auspices of time pressure, competition and profit-making, patients' values, needs and preferences are often given little consideration or are diagnosed incorrectly.

Our interest in decision-making aids stems from the observation that while there is talk of – and a demand for – patient empowerment and engagement, the prerequisites for this often do not exist. Patients typically lack adequately prepared information (both qualitative and quantitative) that allows them to make decisions, and also lack assistance in correlating this information with their own living conditions, taking into account their personal experiences, values, priorities and preferences.

The project had explored the extent to which the opportunities offered by digitalisation can be used to support (potential) patients (and their healthcare providers, as necessary) in the decision-making process, as well as to optimise interfaces with medical care. The potential of elements like patient narratives, serious moral games and machine-based learning, in particular, was explored in this context.

Part of the project involved developing ways to conduct an automated semantic analysis of measurable, everyday activities and contexts. Semantic activity annotation makes it possible to establish a unique activity vocabulary that reflects individuals in visual or other forms. This would allow decision-making activities to be inferred largely automatically through activity sequences, for instance. The frequency or distribution of decisions or the relationship between decisions and contexts could also be analysed and made available to individuals. The starting point for this was to use the extensive personal data already collected on individuals at various levels. To this end, structures were designed that allowed the use of individual data accounts in compliance with all relevant regulations. This information could also form part of a decision support profile.

Team

- Nikola Biller-Andorno (lead)
- Mike Martin (lead)
- Harald Atmanspacher
- Phyllis Barth
- Burcu Demiray
- Mirriam Tyebally Fang
- Andrea Ferrario
- Petros Koumoutsakos
- Minxia Luo
- Federico Massini
- Corine Mouton Dorey
- Johann Roduit
- Dorothy Sabet Rohrbasser
- Karin Seiler
- Carina Manuela Solothurnmann
- Kristina Yordanova

Selected events

Workshop *Prediction of Health-Relevant Decisions and Their Ethical Dimension.* (2018)

Workshop *Empowering Pregnant Women and Their Partners to Make Informed Decisions about Prenatal Testing.* (2019)

Workshop *Regulating Algorithms for Health? (2019)*

Santa Claus Symposium Excellence in Patient Care (EPC). (2019)

Workshops *Motivation & Healthy Ageing.* (2019 and 2020)

Workshops *Dyadic Dynamics.* (2019 and 2020)

Kick-off-Meeting *PubliCo – Exploring Corona-related Public Perception through a Digital Platform.* (2020)

Workshop *Serious Moral Games.* (2020)

Workshops Semantic *Analysis of Multi-Scale Health Dynamics.* (2018, 2019 and 2020)

Selected publications

N. Biller-Andorno: *Digitalisierung im Gesundheitswesen – Digitale Transformation, Patientenorientierung und ethische Ansprüche.* In: Schweizerische Ärztezeitung (2017), 98(0102):18–19.

M. Martin, R. Weibel, C. Röcke, S. M. Boker: *Semantic Activity Analytics for Healthy Aging: Challenges and Opportunities.* In: IEEE Pervasive Computing (2018), 17(3):73–77.

S. M. Boker, M. Martin: *A Conversation between Theory, Methods, and Data*. In: Multivariate Behavioral Research (2018), 1–14.

M. Martin, H. Atmanspacher: *Report of the 1st International Transdisciplinary Workshop «Semantic Analysis of Multi-Scale Health Dynamics»,* Collegium Helveticum: 2018.

N. Biller-Andorno, A. Biller: *Algorithm-Aided Prediction of Patient Preferences — An Ethics Sneak Peek*. In: The New England Journal of Medicine (2019), 381:1480–1485.

H. Atmanspacher, M. Martin: *Correlations and How to Interpret Them*. In: Information (2019), 10:272.

M. Luo, M. L. Robbins, M. Martin, B. Demiray: *Real-life Language Use across Different Interlocutors: A Naturalistic Observation Study of Adults Varying in Age.* In: Frontiers in Psychology, Language Sciences (2019).

M. Martin, C. Röcke, R. Weibel, L. M. Robledo, M. Mehl, T. Lum: *Real-time Assessment of Intrinsic Capacity and Functional Ability: Multi-country Study Documenting Older Adults' Interactions with their Environments.* WHO Working Paper (2019).

K. Yordanova, B. Demiray, M. Mehl, M. Martin: *Automatic Detection of Everyday Social Behaviours and Environments from Verbatim Transcripts of Daily Conversations.* In: Proceedings of IEEE International Conference on Pervasive Computing and Communications, Kyoto, Japan. March 2019, 242–251.

M. Luo, G. Schneider, M. Martin, B. Demiray: *Cognitive Aging Effects on Language Use in Real-life Contexts: A Naturalistic Observation Study.* In: A. K. Goel, C. M. Seifert und C. Freksa (Eds.): Proceedings of the 41st Annual Conference of the Cognitive Science Society. Montreal, QB: Cognitive Science Society 2020, 714–720.

N. Biller-Andorno, A. Ferrario, S. Joebges, T. Krones, F. Massini, P. Barth, G. Arampatzis, M. Krauthammer: *AI Support for Ethical Decision-Making around Resuscitation: Proceed with Care.* In: medRxiv (2020).

M. Luo, R. Debelak, G. Schneider, M. Martin, B. Demiray: *With a Little Help from Familiar Interlocutors: Real-world Language Use in Young and Older Adults.* In: Aging and Mental Health (in preparation).

A. Ferrario, B. Demiray, K. Yordanova, M. Luo, M. Martin: *Social Reminiscence in Older Adults' Everyday Conversations: Automated Prediction Using Natural Language Processing and Machine Learning.* In: Journal of Medical Internet Research (2020), 22(9), e19133.

M. Luo, M. Neysari, G. Schneider, M. Martin, B. Demiray: *Linear and Non-Linear Age Trajectories of Language Use: A Laboratory Observation Study of Couples' Conflict Conversations.* In: The Journals of Gerontology: Series B, gbaa041.

WHO Baseline Report on the Decade for Healthy Aging. Contributing authors include multiple team members and outputs from workshops. (2020; in preparation)

A. M. Freund, M. Hennecke, V. Brandstätter, M. Martin et al.: *Motivation and Healthy Aging: A Model and Research Agenda.* Journals of Gerontology. (2020; in preparation)

Privacy and the value of data

The 'privacy paradox' is widely known. It encapsulates the fact that while most of us are concerned that our personal data could fall into the hands of unauthorised persons, very few of us take measures to protect our data privacy. This includes data related to purchasing behaviours, as well as data on mobility, social networks or learning outcomes, and even data on personal health and healthcare. The observable inconsistency between privacy concerns and data handling is interesting because, among other things, it is blocking the dissemination and use of apps like the Covid-19 app or apps for recording CO_2 emissions linked to individual mobility.

There are numerous explanations for the privacy paradox. Approaches that focus on a lack of knowledge about data and how to manage it are of particular interest. Also of interest are approaches that assume that the value individuals attach to their data is significantly less than one might expect based on complaints about privacy violations in connection with personal data and based on the assumed profits from using the data.

This research project has been mainly concerned with the empirical investigation of the relevance of these two approaches in explaining the privacy paradox. It has been investigated what citizens know about data, data processing and data centres, for instance. On the basis of several surveys, individuals' knowledge about ways to protect their data was compared with their concerns about the inappropriate handling of their data. If individuals expressed concern, they were also asked about the techniques they use to protect their data.

Laboratory experiments investigated how much information individuals disclose about themselves on social networks like Facebook, how much they know about ways to protect their data, whether and at what price they would sell their data to other, non-commercial users, and whether or how individuals can learn to reduce the inconsistency of their behaviours related to data privacy.

A field experiment explored the concerns of individuals about the unauthorised use of their mobility data in connection with the use of a mobility app.

An online experiment provided information on what kind of data (such as data on purchasing behaviour or personal health) individuals are willing to share with what kind of people (family, friends or people who are less close to them) and whether or not they expect something in return.

Finally, the value component of the data has been considered from an environmental perspective. The provision, use and storage of data requires the use of electricity. In this context, different data centres in different countries require different resources and quantities thereof. Hence – in addition to the value for the commercial use of data or for the use of personal data for government tasks, such as traffic planning – values related to the data usage and storage infrastructure have to be considered.

All sub-projects show that the privacy paradox has a lasting impact on the way individuals handle data. Individuals' knowledge of data, data use, data protection and data storage is consistently low. Lack of knowledge seems to play an important role in explaining the privacy paradox, yet the value that individuals attach to their data does not seem

to be very high either. Improving private individuals' knowledge of how to protect their own data could help to overcome the inconsistency between the perceived risk of data misuse and actual data protection practices.

Team
- Renate Schubert (lead)
- Scherwin Bajka
- Monika Dommann
- Flavia Hug
- Petros Koumoutsakos
- Ioana Marinica
- Luca Mosetti
- Fatih Öz
- Hannes Rickli
- Florent Thouvenin
- Yifei Wang

Selected events
Workshops *Privatheit von Daten – Wie besorgt sind wir?* and *Spuren von Infrastrukturen – Arbeit an Rechenzentren.* Summer academy of the Swiss Study Foundation. (2018)

Panel discussion *Autonomes Fahren: Sicherheit und Risiko in einer algorithmisierten Welt.* With: E. Frazzoli (ETH Zurich), R. Schubert (Fellow, ETH Zurich), F. Thouvenin (Associated Fellow, University of Zurich), N. Zurkinden (University of Zurich), B. Zahnd (AXA). (2018)

Panel discussion *Digitale Demokratie – E-Voting und Manipulation.* With: A. von Gunten (Digitale Gesellschaft Schweiz), M. Hostettler (Federal Chancellery), C. Longchamp (gfs.bern ag), A. Perrig (ETH Zurich), R. Schubert (Fellow, ETH Zurich), F. Thouvenin (Associated Fellow, University of Zurich). (2019)

Exhibition *Privatsphäre – geschützt, geteilt, verkauft.* Zurich town hall. (2019/2020)

Exhibition *Wired Nation – Landschaft, Architektur, Infrastruktur.* Semper Observatory. (2019/2020)

Selected publications
R. Schubert, P. Koumoutsakos, G. Arampatzis, Y. Wang, F. Hug, I. Marinica: *Are People Willing to Share Their Personal Data? – Insights from Two Survey Studies.* Working Paper No. 1, Collegium Helveticum, 5 July 2018.

R. Schubert, I. Marinica: *Facebook Data: Sharing, Caring, and Selling.* In: Conference Paper, International Conference on Cyber Situational Awareness, Data Analytics and Assessment (Cyber SA 2019), Oxford, United Kingdom, 3–4 June 2019, IEEE, 8899743.

R. Schubert, S. Bajka, F. Öz: «How Clean are ‹Clean› Data Centers?» In: M. Dommann, H. Rickli, M. Stadler (Eds.): *Data Centers. Edges of a Wired Nation.* Zurich: L. Müller Publishers 2020, 106–137.

R. Schubert, I. Marinica: «Wait, My Data Goes Where? Perceptions of a Secretive Industry as Revealed by a Representative Sample Survey». In: M. Dommann, H. Rickli, M. Stadler (Eds.): *Data Centers. Edges of a Wired Nation.* Zurich: L. Müller Publishers 2020, 310–339.

R. Schubert, I. Marinica, L. Mosetti: *The Privacy Paradox: Privacy Concerns Versus Behavior in the Case of Swiss People.* Working Paper, Collegium Helveticum (in preparation).

R. Schubert, I. Marinica, L. Mosetti: *Willingness to Sell Social Media Data. A Laboratory Experiment.* Working Paper, Collegium Helveticum (in preparation).

R. Schubert, I. Marinica, L. Mosetti, S. Bajka: *Mitigating the Privacy Paradox through Higher Privacy Literacy? Insights from a Lab Experiment Based on Facebook Data* (forthcoming).

A. Götz, H. Mayr, I. Marinica, R. Schubert: *Privacy Concerns of Mobility App Users – Less Privacy for the Sake of a Better Environment?* (forthcoming).

Autonomies in the digital society

Throughout the decades, societies that have used computers, networks, programs and data to support their processes and communications have frequently grappled with questions of autonomy, whether of machines, systems, user groups or organisations. Such questions accompanied the first computer-aided automation projects in the 1950s, the development of operating systems in the 1960s, and the interconnection of computers in the 1970s, and became especially prominent in the 1980s with the advent of personal computers – which opened up brand-new ways of defining and delimiting users. Later, discussions about new computer-aided forms of autonomy were sparked by the internet hype of the 1990s and the concept of autonomic computing in the early 21st century. Nowadays, it is all but impossible to avoid debates about the promises and perils of self-driving cars and self-learning algorithms.

The project on autonomies in the digital society attempts to interpret these debates as historical moments of sociotechnical self-affirmation. Through a historical lens, it investigates topics such as areas of negotiation in the Swiss federal administration, the evolution of digital federalism, algorithmic knowledge production and computing at the limits of the computable.

Team
- David Gugerli (lead)
- Harald Atmanspacher
- Joachim M. Buhmann
- Moritz Mähr
- Nick Schwery
- Ricky Wichum
- Maya Wohlgemuth
- Daniela Zetti

Selected events

Lecture *Das Autonomieproblem digitaler Gesellschaften.* Speaker: D. Gugerli (Fellow, ETH Zurich). (2018)

Workshop *Computer, Administration, and History.* (2018)

Conference *Digital Federalism in the History of Technology and Knowledge, 1970–1995.* (2019)

Symposium *Algorithmic Knowledge Production – Principles, Problems, Prospects.* With: H. Atmanspacher (Collegium Helveticum), J. Buhmann (Associated Fellow, ETH Zurich), L. De Mol (University of Lille), M. Gabriel (University of Bonn), R. Renner (ETH Zurich), F. Thouvenin (Associated Fellow, University of Zurich), J. Teichmann (ETH Zurich). (2020)

Selected publications

D. Gugerli: *Wie die Welt in den Computer kam. Zur Entstehung digitaler Wirklichkeit.* Frankfurt a. M.: S. Fischer Verlag 2018.

D. Gugerli, D. Zetti: *Digitale Gesellschaft.* Historisches Lexikon der Schweiz (2018).

D. Gugerli: *Digitalkolumne. Das Autonomieproblem digitaler Gesellschaften.* In: Merkur. Deutsche Zeitschrift für europäisches Denken 73 (837) 2019, 63–71.

D. Gugerli: *Supercomputer – An der Grenze der Berechenbarkeit.* In: Merkur. Deutsche Zeitschrift für europäisches Denken 73 (846) 2019, 53–59.

D. Gugerli, R. Wichum: *An den Grenzen der Berechenbarkeit. Supercomputing in Stuttgart.* Zurich: Chronos-Verlag 2021.

D. Gugerli, R. Wichum: *Simulation for All. The Politics of Supercomputing in Stuttgart.* Zurich: Chronos-Verlag 2021.

D. Zetti, R. Wichum (Eds.): *Geschichte des digitalen Zeitalters.* Frankfurt a. M.: S. Springer Verlag 2021 (in preparation).

Digital infrastructures

This project has examined the past and present material environments of electronic devices and their associated aesthetic, economic and social processes. Usually, these digital infrastructures operate unseen; it is neither apparent which (human and non-human) elements of these structures can have what effect and when, nor is it clear which stakeholders organise, manage and control the activities of systems and the manner in which their economy functions. It was intended to use two research avenues to find out more about these relationships. The first focused on data centres in Switzerland. In particular, we were interested in the links between the centralisation and networking of digital computing, storage, transfer and deletion and their local anchoring. The second approach explored the vicissitudes of the visibility and invisibility of digital processes and infrastructures. Through a specially developed experimental system, the physical emissions of electronic devices were made discernible and interpreted as physical traces of data processing in its everyday environment.

Team
- Monika Dommann (lead)
- Hannes Rickli (lead)
- Sascha Deboni
- Ann-Kathrin Eickhoff
- Andrea Helbling
- Marc Latzel
- Ioana Marinica
- Mike Martin
- Christian Ritter
- Max Stadler
- Giorgio Scherrer
- Renate Schubert
- Christoph Stähli
- Andrés Villa Torres

Publications
M. Dommann, H. Rickli, M. Stadler (Eds.): *Data Centers. Edges of a Wired Nation.* Zurich: L. Müller Publishers 2020.

Exhibitions
Wired Nation – Landschaft, Architektur, Infrastruktur. Semper Observatory. (2020/21)

Works of art
Kaltgang, Hannes Rickli, 2020. Installation, dimensions and weight 500 x 260 cm/2200 kg.

Radio Wetteralgorithmen, Valentina Vuksic and Hannes Rickli, 2020. Radio installation.

‘Digital society’ is a form of societal self-description

The digital revolution has fundamentally changed the ways in which we organise and experience society. What forms has this change taken and what consequences has it had? Historian David Gugerli and geronto-psychologist Mike Martin discuss these questions with philosopher Barbara Bleisch.

Barbara Bleisch: I bought my first computer 25 years ago, sent my first email 20 years ago, and have owned a smartphone for nine years. I can hardly imagine life without these three things. Mr Gugerli, as a historian, you’ve been studying the history of technology – and especially that of computers – for many years. Hand on heart, did you see this development coming?

David Gugerli: No, of course not. And I’m not the only one. Nobody could foresee such a development.

Digitalisation is sometimes referred to as the third industrial revolution. The first industrial revolution was mechanisation, and the second was electrification. Is digitalisation comparable to these first waves of industrialisation?

Gugerli: You can, of course, draw comparisons with these developments if you want to. The question is what you gain by doing so. Above all, I have reservations about the term ‘revolution’. A revolution is rather a lame duck if it lasts for seventy years. I don’t know when exactly the digital revolution took place in the last seventy years – and I wouldn’t know about the industrial revolution either. What should the revolution be tied to? Mass motorisation, pharmaceutical and

clinical developments, agriculture? Or rather the organisation of production processes and the development of capitalist economic methods? 'Revolution' is not the right term for such developments.

As a historian, you're interested in the history of the computer, yet at the same time you look into the future and try to predict things.

Gugerli: Actually, I don't – although the question of the future comes up again and again. In principle, I'm much more interested in the blueprints of the future that were created in the past; there are a lot of them and most of them got it completely wrong. I suppose that's no different today.

The philosopher Odo Marquard coined the phrase 'the future needs the past'; the future can only be shaped if we understand where we come from. Perhaps that's the reason we ask historians about the future?

Gugerli: Perhaps it's better to speak of 'expectations' in this context. What are the current expectations towards which I can and should direct my actions? Expectations are closely linked to experiences, and they're an important instrument for self-orientation and for trying to orientate others. But what will the future look like? We, like anyone else, didn't know that fifty years ago. Blueprints of the future, which we produce by the metre, may be instantly discarded – and therefore become research material for historians.

Nevertheless, historians have recently become the augurs of our time. Consider Yuval Noah Harari, Philipp Blom or Niall Ferguson, all of whom are also being questioned about the future.

Gugerli: Perhaps this fills a gap in the market?

"Blueprints of the future, which we produce by the metre, may be instantly discarded – and therefore become research material for historians."

David Gugerli

Mr Martin, you're a gerontological psychologist and, among other things, your work revolves around illness definitions and medical imaging. In your field, would you describe digitalisation as a revolution?

Mike Martin: My area of expertise is located in the eye of this revolution's storm, so to speak. Public healthcare, in particular, is being completely overhauled. Take the cost issue, for example. The Swiss healthcare system costs over CHF 80 billion a year. How can we actually measure whether we've also become a healthier country over time – when we already invest so much? Up to now – also during the coronavirus pandemic – we've measured this by collecting population probabilities, so we ask who's getting sick and who has a particular symptom. Our healthcare model is therefore purely based on symptoms. You're healthy if you don't have Covid-19, suffer from depression, develop dementia, or are otherwise ill. The surveys are carried out independently of individual circumstances. However, this distorts the picture. Thanks to digital instruments, we can measure health in context today. This is revolutionary and, if the data were taken seriously, it would

change a great deal! But regulatory authorities currently require context-independent efficacy measurements for active ingredients, despite the fact that their effects naturally depend on the context of use.

For example, if I'm taking a painkiller, the regulatory authority requires that it's been tested in a clinical trial, independent of context. If I understand you correctly, you think this is completely outdated. Rather, we should observe under what circumstances people take the tablet and what their physical condition is when they do so?

David Gugerli is professor of the history of technology at ETH Zurich.

Martin: One question is whether a particular active ingredient is effective in the same person only in certain situations, or whether it's effective in all of them. Another question is what's the point of measuring efficacy? Under today's prevailing model, the symptom should typically be less severe than before. But things could also be done differently – and that's precisely the direction in which we are heading, whereby effectiveness is measured by the way each individual functions. Does a drug allow the person to go about their daily life in the way they'd like? Are they better off with medication than without it? Today, standardisation means conducting research under exactly the same contextual conditions. We negate the fact that symptom-free treatment means something completely different for one person than for another. Digitalisation makes it possible to determine for each individual person – and at any given time – whether they can do what's important to them or what they value. If we work with a functional and contextualised understanding of efficacy like this, it can significantly increase effectiveness, by a factor of 20 by my estimation.

And against this backdrop, what are the benefits of digitalisation and the fact that we live in a so-called 'digital society'?

Martin: Health can be measured outside a laboratory at low prices.

With a smart watch, for instance?

Martin: For example. Or with a smartphone or sensors. It's all cheap and can be used by anyone. As a result, the previous data collection monopolies in healthcare, i.e. the clinics or universities, will face competition. Now we can all measure whether something was effective in a particular context or not, and we can do it even more accurately, because we not only measure pain or limitation; we also record what we succeed in doing and what our everyday life looks like. So in future, the healthcare system's customers will be able to determine for themselves whether or not a measure has been effective.

May I ask you a personal question? Are you a self-tracker?

Martin: Within limits, yes.

You're not wearing a watch.

Martin: You can also observe yourself. You naturally want to know whether a training session has the desired effect and, if so, under which conditions this is best achieved. We all observe what we do. There are theorists who say that behaviour is not the answer, but the question. In this sense, we tend to see our environment as a constant experiment. What happens if I do a specific thing and avoid others? How do other people react to me? This everyday observation can also be supported by measuring devices. However, not everything can be measured equally well. Movement is easier to measure than thought. That's why most health monitoring kits are movement-measuring kits.

We live in a so-called 'digital society'. If we were to conduct a street survey on what constitutes the digital society, many would probably say: I send emails, most people have a smartphone, and I may take selfies today and share them on the internet. Is this the digital society?

Gugerli: The term 'digital society' is a form of societal self-description. A society is called digital because it's shifted its methods of communication and interactions into a space supported by computers, where it then organises them. If you write emails, do online banking, write a blog, or look up train times on your smartphone, you're part of what we can call the 'digital society'.

Such forms of self-attribution come and go, and are continually being replaced by new ones. We've already talked about the knowledge society, the risk society and the fun society. Will we remain a digital society, or will we at some point become something new?

Gugerli: The problem with your question lies within the question itself. Of course, we aren't just members of a single society. Mike Martin is, among other things, a member of the society of the University of Zurich, while I'm part of the society of ETH Zurich – but, thank God, maybe not after we go home at the end of the day! You might be a club member or play in an orchestra, or you might be in a sports association or meet up with friends. We constantly change our social situation and participate in societies with different rules. A faculty is not a shooting club. In this respect, we're still not just members of a 'digital society'.

Data is often referred to as the oil of the 21st century. You both find this problematic. Why does this impression persist?

Martin: It's probably because the term 'data' is used to refer to various things and, in this respect, it represents a projection screen. From the point of view of health or age research, I can say that the available data gives a very undifferentiated picture of older people in our country. Ageing is a complex and heterogeneous phenomenon. However, the data we have is extremely unsophisticated. It simplifies and eliminates valuable information. This has immediate effects – as we have just seen in the pandemic. In the absence of differentiated data, such as data on what's beneficial or risky for an individual or group of people, we're forced to make generalisations across large groups. The question of how we map the complexity of reality in our data is therefore a crucial question. If data in the health sector is only available for the 65+ age group as a whole, everyone 65 or older must be treated equally, even though this group is extremely heterogeneous. For data to be valuable, it must be segmented, contextualised and interpreted.

Mr Gugerli, do you agree?

Gugerli: Yes. Incidentally, the term data is not very old. It hardly ever occurred in the 19th century; at that time, it was reserved for highly elaborate measurements or natural constants. Not even statisticians spoke of data. They counted and had figures; they reported what the figures told them and information. In the Swiss Statistical Yearbook, the word only appears for the first time in the early 20th century. At that time, mechanised administration was very much about data. They wanted to be able to make statements in as minimal and stable a format as possible, for instance about the number of passengers carried and shoes sold. From the 1960s onwards, there was a term for data that aimed to make information retrievable. Data helped to search for something, like an address or a product in a warehouse, and the computer managed the addresses and quantities needed for this. In the 1970s, when work began on relational databases, the concept of data changed again: how could something new be extracted from data by recombining datasets in novel ways? Today, data is used to build algorithms that can analyse data. Data is not provided, but produced, and it then, in turn, has a productive effect. We're in the middle of a rapid process of modifying data, its meaning, its effect and its production.

When we talk about data, a discourse on privacy is usually not far away. With every purchase I make and every ticket I buy, I leave a data trail – and few people want this trail to be stored and interpreted. But you think the debate about privacy is overegged, correct?

Gugerli: Today, privacy is mainly discussed as something threatened. However, if you take a closer look at privacy, you'll see that it's currently expanding – at the expense of the public. It's taking up more and more space and is becoming increasingly differentiated.

> "For data to be valuable, it must be segmented, contextualised and interpreted."
>
> Mike Martin

Can you give an example?

Gugerli: Take a look at Facebook. Facebook is a private club of clubs through which you can selectively network. You can also have multiple identities and communicate with one group in one way and another group in another. You might also open another account for business and so on. This is all private. And private providers – so not just Mark Zuckerberg – have bought rights to it; they provide support to make the network work. That's all private, too, not public. Or take public spaces. A city square in the middle of Zurich is fenced in with clockwork regularity three or four times a week and has entry control. Once inside, you can visit a circus, attend a riding school, or enjoy any number of concerts and mega events – all of which are private. That's why I say it's the public sphere that's under threat, not the private one.

Nevertheless, many share the view that privacy is under threat in that informational self-determination is being undermined. After all, the debate isn't just about how private spaces relate to one other and who owns them, but also about whether or not I retain sovereignty or autonomy over what happens to the things I do, think and say. Mr Gugerli, you consider autonomy an 'area of negotiation'. What do you mean by that?

Mike Martin is professor of gerontopsychology and gerontology at the University of Zurich.

Gugerli: I can imagine neither an autonomy without users, nor an autonomy without an authority granting autonomy. You can demand autonomy and you can grant autonomy, but you're always only autonomous in relation to framework conditions – in relation to a law or a nomos that otherwise applies to everyone. In other words, autonomy is to be understood contextually and has to be negotiated. Within certain regions, in political systems, and in intra-familial differentiation processes, etc. the autonomy you demand and make use of cannot be defended without reference to a context. It always applies to a specific area and can only be used, violated, expanded or reduced in that area. Autonomy isn't something that applies to me, alone; it presupposes the other, meaning it's always relational.

Is that how you see it, Mr Martin?

Martin: Well, we are of course directly affected by the concern for autonomy and informational self-determination, inasmuch as the question of what happens to one's own data is an important concern for the subjects participating in our studies. Under the current regulatory model for data collection in research, data must be anonymised and it must be ensured that this data is not in any way misused by any third party. However, the situation is different today than it was in the past, as data is no longer in one place, but can largely be shared. If I ask someone to provide me with data on their movements during the previous month, they'll continue to have access to this data in the same way as me. We therefore need a different model that makes it clear that data collection can always benefit many people. We've moved on to say that data collection is nothing more than a way for the data subject to learn about themselves. The data collection device is yours, and you collect and store your own data. As a scientist, I simply knock on the door and ask if you would be willing to provide me with a copy of your data for a specific research topic. You don't have to give it to me. This is a different model from the one we're using in studies today. It doesn't currently exist, but it wouldn't be impossible. This desire for an autonomous decision regarding

the use of our own data means that we have to change the way we collect and use data.

Finally, I have a more general question: innovation is and always has been accompanied by criticisms of technology. On the first train ride in 1835, for example, doctors warned of brain diseases and pneumonia, as the speed of this new means of transport simply seemed too fast …

“Autonomy is to be understood contextually and has to be negotiated.”

David Gugerli

Gugerli: Criticism of technology isn’t just a brake on innovation – on the contrary! The development of new technologies and processes requires criticism. You have to take a close look at conventional technology, identify its weaknesses, and ultimately declare it to be deficient if you want to identify the need for innovation at all. Only then do we try to supplement and improve an existing technology with critically selected additional machines, processes, procedures and considerations. Technology criticism is essential for innovation. And successful technological development is critical.

Editing: Barbara Bleisch and Martin Schmid
Photos: Andrea Ganz

Cross-project activities

In addition to the five research projects established by the Collegium Helveticum fellows, a number of projects were developed between 2016 and 2020 in collaboration with the fellows and external partners, all of which were dedicated to the topic of digital societies. These supplementary activities ranged from themed weeks on various sub-topics of digitalisation, through exhibitions and exhibits, to the development of an interactive website that provides an overview of groups that are currently grappling with questions related to digital societies.

Scientifica 2017: What Data Can Reveal

The Collegium Helveticum presented a video installation entitled *What Data Can Reveal* at Scientifica 2017, held from 1 to 3 September 2017 at the University of Zurich and ETH Zurich and attended by over 30,000 people. Against the backdrop of their respective disciplines and transdisciplinary research projects conducted at the Collegium Helveticum, the seven fellows made short statements providing insights into what they believe data can reveal.

Mapping Digital Societies

In Switzerland, numerous initiatives are currently investigating digitalisation and its effects on society. The institutional actors involved in such initiatives hail from academia, business, politics, public administration and the art and culture sector. As a result, the cross-cutting topic of digital societies was being approached from a variety of angles and with a wide range of objectives in mind. The project, implemented by the Collegium Helveticum and the University of Zurich's Digital Society Initiative (DSI), offered the first ever systematic overview of stakeholders in Switzerland who are tackling questions related to digital societies. The foundations for this were laid in partnership with consulting firm EvalueScience. The results were presented on the interactive website www.digitalsocieties.ch together with information on the initiatives and institutions working on the topic of 'digital societies', as well as the latter's fields of activity, key research topics and relevant networks.

Reflecting Privacy
(themed week, 2017)

Navigating privacy is one of the key challenges in the digital age. The question of what is private and how to deal with privacy permeates all aspects of the digital society. It affects the everyday lives of individuals, and also influences politics, business, science and the arts. While privacy is being considered in each of these areas, dialogue between the various actors, institutions and disciplines is still in its infancy. During a themed week entitled *Reflecting Privacy*, held from 20 to 25 November 2017 as part of the Collegium Helveticum's 20th anniversary celebrations, the Collegium intensively explored how concepts and ideas of privacy are changing against the backdrop of the digital transformation – and what social, economic and political implications are associated with this.

Screening: *Risk* by Laura Poitras (USA 2016)
Discussion with: Monika Dommann (Fellow, University of Zurich), Petros Koumoutsakos (Fellow, ETH Zurich)

Von der Sternwarte zur Citizen Science
Speaker: Kevin Schawinski (ETH Zurich)

Der Wert von Privacy
Workshop with: David Gugerli (Fellow, ETH Zurich), Renate Schubert (Fellow, ETH Zürich), Angelika Steger (ETH Zurich), Florent Thouvenin (Associated Fellow, University of Zurich), Ricky Wichum (Collegium Helveticum)

«Dr. Cyber» – oder wer sorgt eigentlich für unsere digitale Gesundheit?
Workshop with: Nikola Biller-Andorno (Fellow, University of Zurich), Markus Christen (University of Zurich)

Good Hack – Bad Hack?
Panel discussion with: Gleb J. Albert (University of Zurich), Ivan Bütler (Ethical Hacker, Compass Security), Marc Henauer (Federal intelligence service), Felix Stalder (ZHdK), Carmen Weisskopf and Domagoj Smoljo (artists, !Mediengruppe Bitnik)

Die Zukunft von «Privacy» im Zeitalter der Künstlichen Intelligenz
Lecture by: Urs Gasser (Harvard University)

Leaking and Privacy
Workshop with: Catherine Boss (*SonntagsZeitung*) Monika Dommann (Fellow, University of Zurich), David Gugerli (Fellow, ETH Zurich), Oliver Zihlmann (*SonntagsZeitung*)

Das Ende der Geheimnisse – Wirtschaft und Gesellschaft in Netzwerken
Talk with: Mathias Bünte (EY), Michael Hengartner (University of Zurich), Rudolf Minsch (economiesuisse), Sophie Mützel (University of Lucerne) Ruedi Noser (Council of States), Constantin Seibt (*Republik*)

Algorithms and Their Application (themed week, 2018)

Virtually all aspects of the modern information society, from everyday public life to highly specialised research, have become unthinkable without the use of intelligent algorithms. Algorithms form the basis of all kinds of automation processes. But what does this mean in particular? What kinds of algorithmic control are there? How do they relate to their users? How autonomous can, should and may algorithms be? What questions does this raise for society as a whole, and what are the specific consequences for research and technology? These and similar questions were the focus of the Algorithms and their Application themed week, held at the Semper Observatory from 5 to 12 October 2018.

Performance: {reclaim the twelfth camel} < code of practice
Art performance with: Alexander Tuchaček (artist, Zurich)

Algorithms for Health and Health Research
Workshop organised by: Nikola Biller-Andorno (Fellow, University of Zurich), Mike Martin (Fellow, University of Zurich)

Prediction of Health Relevant Decisions and their Ethical Dimension
Workshop organised by: Nikola Biller-Andorno (Fellow, University of Zurich), Mike Martin (Fellow, University of Zurich)

Anschauung, Algorithmen, Anwendungen
Speaker: Michael M. Resch (Höchstleistungsrechenzentrum Stuttgart)

Algorithmische Wiederaneignung: Codes der Verwandlung
Workshop with: Hannes Rickli (Fellow, ZHdK), Christian Ritter (Collegium Helveticum), Alexander Tuchaček (artist, Zurich)

Autonomes Fahren: Sicherheit und Risiko in einer algorithmisierten Welt
Panel discussion with: Emilio Frazzoli (ETH Zurich), Renate Schubert (Fellow, ETH Zurich), Florent Thouvenin (Associated Fellow, University of Zurich), Nadine Zurkinden (University of Zurich), Bettina Zahnd (AXA)

What Is an Algorithm?
Screening «The Thinking Machine» (1964) and discussion with: Giacomo Indiveri (University of Zurich), Petros Koumoutsakos (Fellow, ETH Zurich)

Predictive Policing
Panel discussion with: Dominik Balogh (City Police Zurich), Raquel Rosés Brüngger (ETH Zurich), Monika Dommann (Fellow, University of Zurich), Nikolaus Pöchhacker (Technical University of Munich)

Das Autonomieproblem digitaler Gesellschaften
Speaker: David Gugerli (Fellow, ETH Zurich)

State, Democracy and Digitalisation (themed week, 2019)

Is it possible to shape the democracy of the future? The triad of state, democracy and digitalisation addresses a bundle of problems and possibilities whose impact

is felt at different levels. While admonishing voices warn that the democratic order is endangered by post-democratic shifts, the authorities expect an increase in information and political participation through the digitalisation of democratic processes. The topic of the state, democracy and digitalisation is of interest to stakeholders representing politics, public administration, science, and civil society, as well as companies – and especially those providing services to public authorities and political parties. A notable tension exists between infrastructural and legal problems affecting the state on one hand, and globally scaled problems on the other. These and similar questions were the focus of the State, Democracy and Digitalisation themed week, which took place from 27 September to 1 October 2019 at the Collegium Helveticum.

Digital Federalism in the History of Technology and Knowledge, 1970–1995
Workshop with; David Gugerli (Fellow, ETH Zurich), Daniela Zetti (Collegium Helveticum)

Digitaler Wahlkampf Schweiz: Warum der Tech-Diskurs nicht dringlich genug ist
Speaker: Adrienne Fichter (*Republik*)

Empowering Pregnant Women and Their Partners to Make Informed Decisions about Prenatal Testing
Workshop with: Nikola Biller-Andorno (Fellow, University of Zurich), Mirriam Tyebally Fang (Collegium Helveticum)

Regulating Algorithms for Health?
Workshop with: Burcu Demiray (Collegium Helveticum), Mike Martin (Fellow, University of Zurich), Corine Mouton-Dorey (Collegium Helveticum)

Digitalisierung und Demokratie. Was oft vergessen wird
Speaker: Claus Leggewie (Justus Liebig University Giessen)

Digitale Demokratie – E-Voting und Manipulation
Panel discussion with: Andreas von Gunten (Digitale Gesellschaft Schweiz), Mirjam Hostettler (Federal Chancellery), Claude Longchamp (gfs.bern ag), Adrian Perrig (ETH Zurich), Renate Schubert (Fellow, ETH Zurich), Florent Thouvenin (Associated Fellow, University of Zurich)

Privacy – Protected, Shared, Sold (exhibition, 2019/2020)

The Privacy – Protected, Shared, Sold exhibition, which was devised in partnership with the City of Zurich's Department of Culture and curated by Christian Ritter and Sarah Genner (Collegium Helveticum), was held from 19 September 2019 to 29 February 2020 in the Zurich town hall and attracted over 7,000 visitors. It highlighted key aspects of privacy and revealed contradictions in our relationship to privacy. Examples drawn from the past and present were used to illustrate how discussions about privacy reflect social change and the political climate, as well as the moral concepts of their respective eras.

Photographs by Andrea Helbling, Arazebra, from the fellowship project Digital Infrastructures


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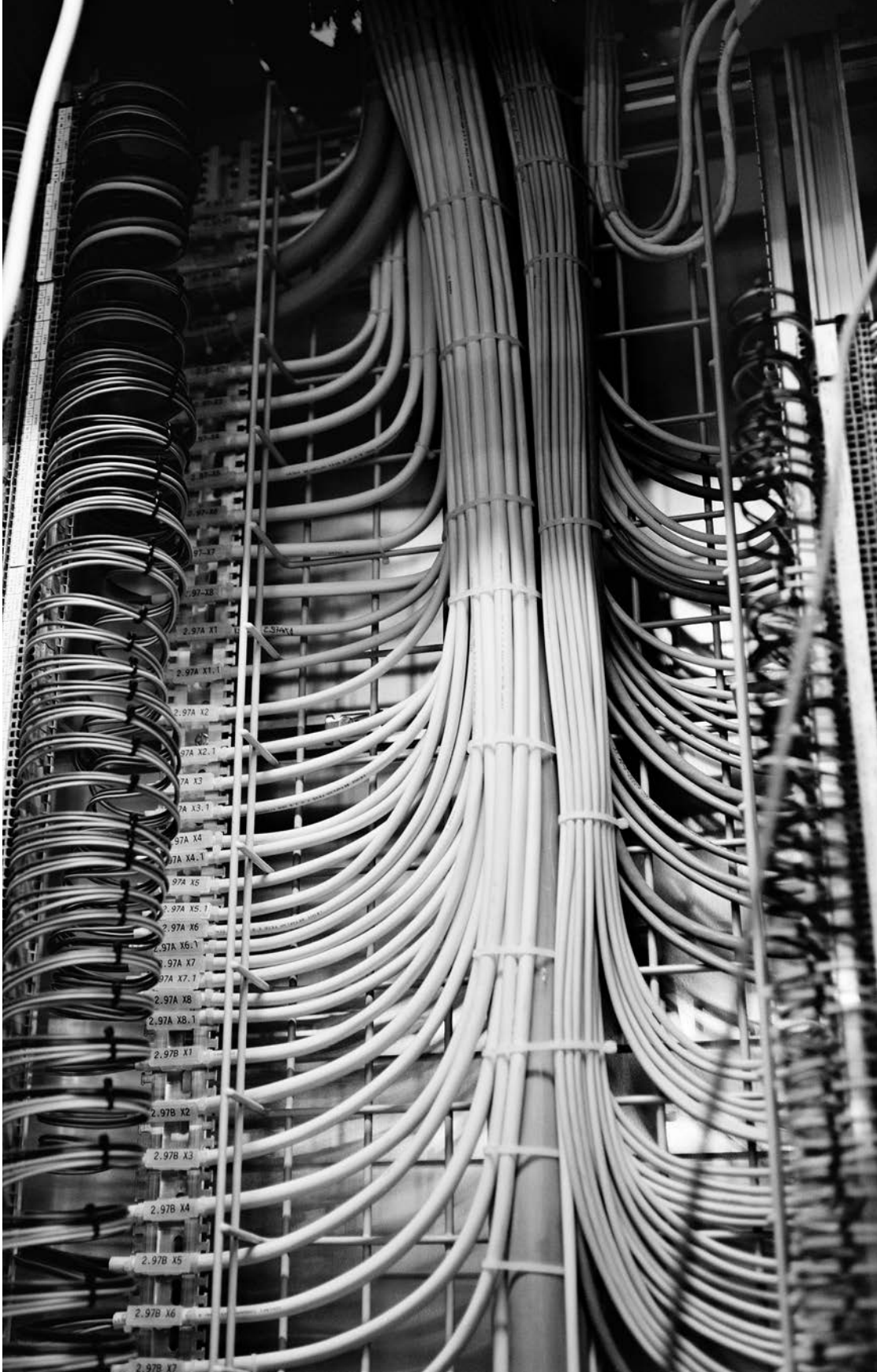
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Art at the Collegium Helveticum

The interweaving of art and science is a key interest of the Collegium Helveticum. The institution's commitment to this aim has now been further strengthened with the addition of the Zurich University of the Arts as a sponsor institution and a fellowship for art. Furthermore, new exhibition spaces are set to establish the Collegium as a venue for artistic and scientific research.

In autumn 2020, the formalism of digital modernity made a powerful appearance at the 150-year-old Semper Observatory. In Rudolf Wolf Hall, infrastructures built around the time ETH Zurich was founded collided with the standardised technology used in modern data centres. The reason for this unusual encounter was the *Kaltgang* (cold aisle) art installation by Hannes Rickli, a professor at the Zurich University of the Arts and a fellow of the Collegium Helveticum.

The installation was a readymade. Originally, it was a cold aisle container, used in data centres to separate hardware that needs to be kept cool from areas with warm air. This separation

is achieved by completely enclosing the carrier modules (the racks), which are used to attach and arrange hardware used to process digital data.

With this sculptural work, the artist evoked the materiality of the supposedly immaterial digital world – a materiality that can be built into infinity on a modular basis. The work of Hannes Rickli was part of the *Wired Nation – Landscape, Architecture, Infrastructure* exhibition held at the Collegium Helveticum. Like the exhibition as a whole, the installation was the result of a joint research effort by historians, artists, economists and ethnographers who have been working on the man-made (yet invisible) infrastructures behind digital data flows.

Hannes Rickli's installation is not the only artistic work in the exhibition that was created through dialogue between scholars and artists. In joint site visits with the academic scholars, photographers Andrea Helbling and Marc Latzel explored the hidden spaces of data centres, and the places and institutions where digital network components are produced. The resulting photo essays were placed in the exhibition next to the *Radio Weather Algorithms* radio installation by media artist and programmer Valentina Vuksic. This installation transmitted acoustic signals from the Swiss National Supercomputing Centre in Lugano to the artistic spaces of the Semper Observatory via a radio station. The works created by members of the Collegium Helveticum were complemented by photographic works by Yann Mingard and two graphic works by the Serbian artist Vladan Joler, including his well-known piece Anatomy of an AI System.

New foundations for artistic and scientific research

Cooperation between the sciences and the arts has been part of the Collegium Helveticum's mission from the very beginning, and thus occupies a corresponding place in the institution's history. The later Documenta artist Roman Ondák (1999/2000), the artistic duo Lutz & Guggisberg (2008/09), the photo artist Hans Danuser (2009/10) and the subsequent Nobel Prize winner for literature Herta Müller (2001) – all former guests of the Collegium Helveticum – are notable examples of this.

A milestone was reached for the arts at the Collegium Helveticum at the beginning of the 2016–2020 fellowship period. In 2016, the Zurich University of the Arts (ZHdK), which had long been loosely associated with the Collegium, became an official sponsor institution alongside ETH Zurich and the University of Zurich. That a university of the arts now occupies such a leading role is unique among international institutes for advanced studies and has created extensive opportunities for the Collegium to explore – and make productive in the

context of transdisciplinary research – experiences, interests and innovations from the broad field of the arts, from the fine arts and design to acting and theory.

For this to succeed, both idealistic and formalistic equivalence are a prerequisite. Since the Zurich University of the Arts has had its own fellow since 2016, fellows from the sciences and the arts can now work together in joint projects – without any restrictions as regards institutional possibilities and the available funding. In their role as a fellow, the (researching) artist no longer has the status of a guest; instead, they are an integral member of the Collegium Helveticum.

This change in role reflects the emancipation from the idea that the dialogue between the sciences and the arts is particularly suitable for giving new impetus to scientific work and promoting out-of-the-box thinking. In contrast, projects like swissuniversities' *Epistemologies of Aesthetic Practices* doctoral programme, a joint venture of ETH Zurich, the Zurich University of the Arts and the University of Zurich launched at the Collegium Helveticum, shed light on the epistemological potential of artistic and artistic-scientific research, and make essential contributions to an understanding of the production and negotiation of knowledge that deviates from the classical scientific form. This is also important for science policy, because it is only through institutionalisation or recognition by the institutions that equivalence can be assured for research and the promotion of artistic and artistic-scientific research. Against this backdrop, the Collegium Helveticum has also been involved with the Swiss Artistic Research Network (SARN) since 2017 and, together with eight Swiss art schools, has contributed to advancing the national and international debate on the role of artistic research. The Collegium Helveticum was similarly involved in the European League of Institutes of the Arts (ELIA) conference organised by the Zurich University of the Arts in November 2020.

Spaces for doing art and science

The claim that the engagement with art and science must lead beyond theory-based reflections of knowledge production but manifests itself in concrete situations of academic and artistic work is paradigmatic for the Collegium's approach. In order to achieve this in the best possible way, the infrastructure of the Collegium Helveticum has been modified to suit the specific requirements of the arts. In autumn 2020, after two years of planning and construction, the Semper Observatory was supplemented by two new exhibition and performance spaces, which offer suitable conditions for presenting artistic works of various kinds. The Collegium Helveticum is thus creating opportunities for dialogue between art and science that are not generally

available in European university environments. In contrast to Anglo-Saxon and Scandinavian universities, which offer artistic training programmes, galleries and art spaces are usually not part of the facilities of universities in Switzerland.

The emphasis on *doing* artistic-scientific practice, which is now also reflected in the rooms available at the Collegium Helveticum, is important because the synergies and distortions that forge the coexistence of art and science often only become clear during the implementation stage. Moderation of the transdisciplinary dialogue is therefore all the more necessary. It helps to explain the working methods and demands of those involved and to translate between knowledge cultures – even if the meeting of science and art is no different from the challenges that accompany cooperation between different artistic movements or scientific disciplines.

Transdisciplinarity is, in many ways, inherent in the arts.

Art and/as collaboration

Experience shows that transdisciplinarity is (also) a matter of practice. Accordingly, the Collegium Helveticum enables artists, scientists and non-university actors to come together in ever-changing configurations in the Semper Observatory. The Collegium Helveticum acts as a driver of and a forum for dialogue between art and science and for the integration of the arts into the work of ETH Zurich and the University of Zurich. In addition to lectures and panel discussions for and by artists, examples of this include a workshop with the Schauspielhaus Zürich on the role of theatre in the digital society (2018), a conference on artificial intelligence and artistic authorship jointly organised with the Zurich University of the Arts and the Swiss Forum for Communications Law SF-FS (2019), and participation in the Zurich University of the Arts' Research Day, organised by the Institute for Contemporary Art Research (IFCAR) (2018). Common to all the activities supported by the Collegium Helveticum


Rudolf-Wolf-Saal

↑ Photographs by Marc Latzel, from the exhibition
└ Wired Nation – Landschaft, Architektur, Infrastruktur.

in the field of art, design and theatre was their focus on digital societies, the central research topic of the 2016–2020 fellowship period.

The fact that the integration of the arts into the Collegium Helveticum programme goes beyond the role of artists as lecturers and discussion partners is reflected in concrete links between projects. The collaboration between the fellows Hannes Rickli (Zurich University of the Arts), Monika Dommann (University of Zurich) and their transdisciplinary project team in the Digital Infrastructures project described at the beginning of this article is just one example of this. Another example is the cooperation of physician and ethicist Nikola Biller-Andorno (University of Zurich), also a fellow of the Collegium Helveticum, with experts from the fields of game design and illustration in the development of 'serious moral games' designed to support patients in their decision-making.

The artistic field has a long tradition of collaborative forms of work operating at the boundaries of science, society and the economy. Transdisciplinarity is, in many ways, inherent in the arts. Integrating this experience into the work carried out at the Collegium Helveticum is a great opportunity. However, at the same time, it obliges us to carefully toe the line between support and appropriation, which must not be lost sight of in our contact with scientific research. During the 2016–2020 fellowship period, conditions were created at various levels to promote and critically observe the interplay of art and science. *CR*

From sound art to theory: art and science 2016–2020

Activities in the artistic field from 2016 to 2020 included collaborative work and contributions from:

!Mediengruppe Bitnik (artists, *Good Hack – Bad Hack*, panel discussion, 2017)

Andrea Braidt (film and media scholar, Vice Rector at the Academy of Fine Arts in Vienna, *Not Only Between, but Even Beyond. Oder: Transdisziplinarität – eine Bestandsaufnahme,* conference, 2016)

Flavia Caviezel (artist and ethnologist, Institute of Experimental Design and Media Cultures IXDM, FHNW Academy of Art and Design, *Cooperation. Practices of Coordination, Cooperation and Representation in Collaborative Processes,* workshop, 2017)

Florian Dombois (artist and director of Focus in Transdisciplinarity (FSP-T), Zurich University of the Arts, *Not Only Between, but Even Beyond. Oder: Transdisziplinarität – eine Bestandsaufnahme,* conference, 2016)

David A. Edwards (Gordon McKay Professor of the Practice of Biomedical Engineering at Harvard University, Director of Artscience and The Lab@Harvard, *Not only Between, but Even Beyond. Oder: Transdisziplinarität – eine Bestandsaufnahme,* conference, 2016)

Barbara Ehnes (freelance set designer, *Theatre in the Digital Society,* workshop, 2018)

Alexander Giesche (freelance director, *Theatre in the Digital Society,* workshop, 2018)

Johannes M. Hedinger (artist, Director of the Institute for Land and Environmental Art, *Cooperation(s). Practices of Coordination, Cooperation and Representation in Collaborative Processes,* workshop, 2017)

Swetlana Heger (artist, Director of the Department of Fine Arts, Zurich University of the Arts, *Digital Art – Artificial and Artistic Intelligences,* conference, 2019)

Andrea Helbling (photographer, *Digital Infrastructures,* research project, 2018–2020)

Sabine Himmelsbach (Director of the House of Electronic Arts, HEK Basel, *Digital Art – Artificial and Artistic Intelligences,* conference, 2019)

Vladan Joler (artist and media scholar, Director of the Share Foundation and Professor of New Media, University of Novi Sad, *Wired Nation – Landschaft, Architektur, Infrastruktur,* exhibition, 2020/2021)

Marc Latzel (photographer, *Digital Infrastructures,* research project, 2019/2020)

Olia Lialina (artist and media scholar, New Media Professor at the Merz Akademie in Stuttgart, *They May Call It Home,* lecture, 2018)

Yann Mingard (photographer, *Wired Nation – Landschaft, Architektur, Infrastruktur,* exhibition, 2020/2021)

Shintaro Miyazaki (media scholar, Institute of Experimental Design and Media Cultures IXDM, FHNW Academy of Art and Design, *Thinking Toys for a School of Digitality,* lecture, 2017)

Bertold Müller (Managing Director of Continental Europe, Middle East, Russia & India, Christie's, *Digital Art – Artificial and Artistic Intelligences,* conference, 2019)

Thomas Peter (sound artist, sound installation at the Semper Observatory, 2017)

Hans Ulrich Reck (Rector and Professor of Art History in a Media Context at the Academy of Media Arts Cologne, *DIGITAL – Re/Visions,* lecture, 2018)

Hannes Rickli (artist and professor at the Zurich University of the Arts, Fellow of the Collegium Helveticum, *Digital Infrastructures,* research project, 2016–2020)

Cornelia Sollfrank (artist, *Digital Art – Artificial and Artistic Intelligences,* conference, 2019)

Felix Stalder (Professor of Digital Culture and Theories of Networking at the Zurich University of the Arts, *Good Hack – Bad Hack,* panel discussion, 2017)

Alexander Tuchaček (artist and Professor of Art & Media, Zurich University of the Arts, {reclaim the twelfth camel} < code of practice, performance, 2018)

Valentina Vuksic (artist and researcher, Zurich University of the Arts and the University of Birmingham, *Wired Nation – Landschaft, Architektur, Infrastruktur,* exhibition, 2020/2021)

Photographs by Marc Latzel, from the fellowship project Digital Infrastructures


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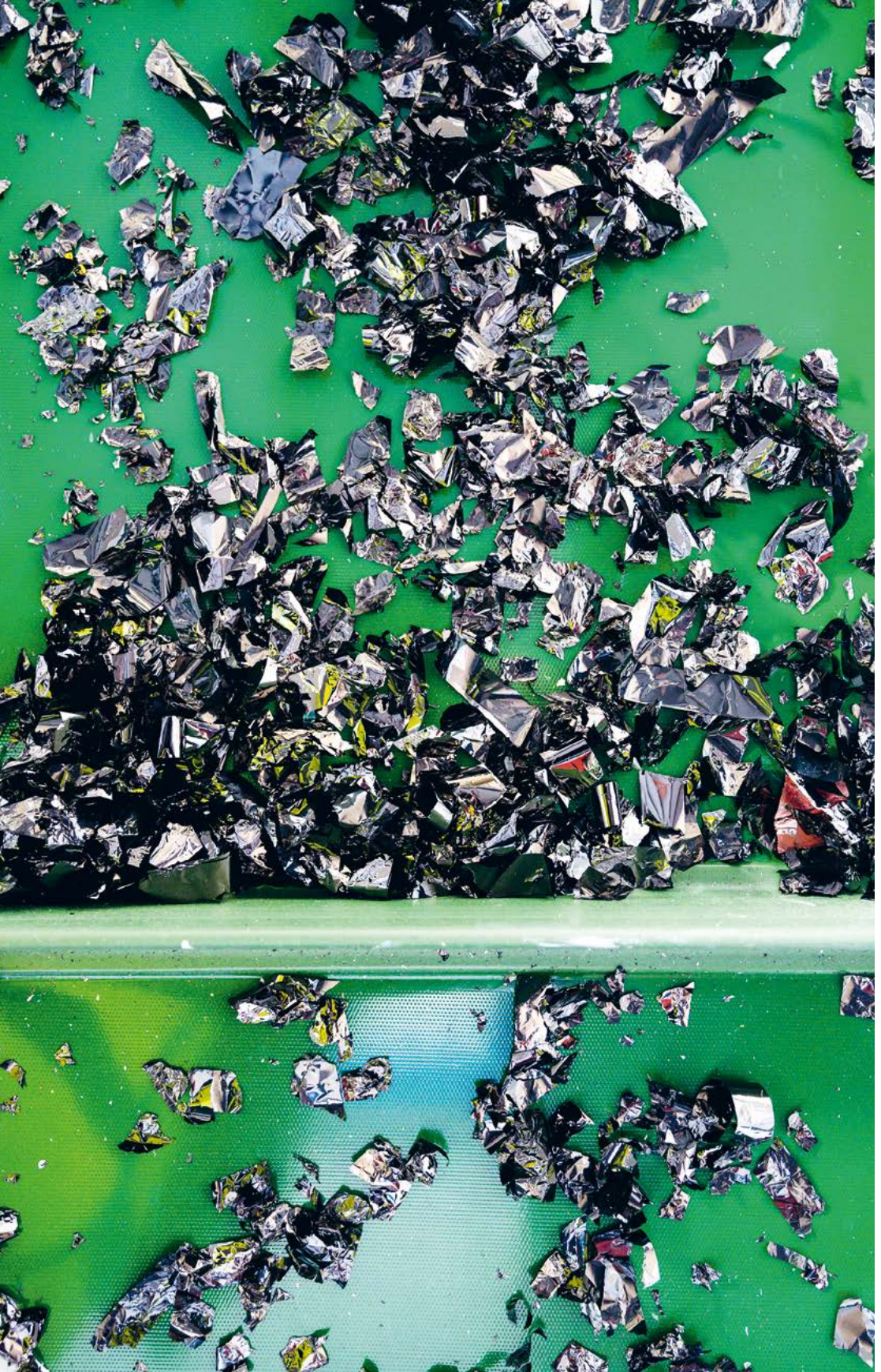

Collaborations: different questions, new solutions

Through cooperation with external stakeholders, research questions take on wider contours and solutions become possible that are not derived from an exclusively scientific perspective. The key factors in this process are time and trust.

Collaborative projects are becoming increasingly important in the higher education sector – not just between those engaged in university research, but also with non-university stakeholders. This is reflected, among other things, in the growing number of initiatives and centres that see collaboration with experts and multipliers from business, public administration, the cultural sector and civil society as part of their mission.

These kinds of transdisciplinary cooperation also play a role in the Collegium Helveticum's self-identified mission. One driver of this is the acceptance that relevant topics and problems can be addressed particularly well through collaborative work – especially those that extend beyond the university/academic context and whose solutions rely on wide-ranging expertise.

Renate Schubert, an ETH Professor of National Economics and a fellow of the Collegium Helveticum, stresses that collaborative projects do not just help to identify factors for adequate solutions. They also help to identify factors that stand in the way of such solutions, but which are not recognised and assessed as hurdles from an exclusively scientific perspective.

Researching the digital society together

When working with the topic of Digital Societies, the forms of collaborative research become even more relevant. Sociotechnical and techno-economic change in connection with digitalisation is a cross-cutting theme that maps onto society at the micro level of everyday life, as well as at the macro level of structures and organisational forms. Digitality provides new opportunities and approaches to making use of knowledge, ideas and resources; but it also poses equally big challenges.

The problems arising between different aspects of digitalisation can only be addressed to a limited extent based on work in laboratories and at university desks alone. The work of Nikola Biller-Andorno, a physician and ethicist at the University of Zurich, as well as a Collegium Helveticum fellow, offers an example of this.

The care of people in need is currently undergoing a drastic change in connection with digitalisation. Nursing robots, cameras, sensors, smart pillboxes and more besides can, on one hand, grant more autonomy in old age. On the other hand, they can also be used for surveillance and lead to a reduction in human care. How to ensure that the positive potential of digital technology can be exploited while minimising its undesirable effects is best studied together with developers and prospective users.

This principle has translated, among other things, into Biller-Andorno's collaboration with Petros Koumoutsakos, a computer scientist at ETH Zurich and a fellow Collegium Helveticum fellow. In their joint project, the two scholars are developing AI-based predictions of patient preferences, i.e. predictions of how (and why) patients choose between several options. This work provides the foundations for a corresponding algorithm that is set to be developed and integrated into medical practice in cooperation with computer scientists and clinicians from the University Hospital of Zurich. In the humanities subjects like ethics in particular, such projects are helpful in linking the meta level of discourse back to concrete practical experience and achieving effects in the real world: "In medical ethics, we could contribute little in substance, aside from a few generalities, without exchanges with practice partners", says Biller-Andorno.

Different roles, different expectations

Research projects with practice partners are not only aimed at the joint development of scientifically solid foundations, but often also include the provision of assessments and recommendations to decision-makers, such as the World Health Organization (WHO) or federal agencies in the public health sector. Stakeholder-oriented research like this, which is expected to result in recommendations for action, requires a high degree of reflection on the quality and weighting of the assumptions on which the relevant research is based. According to Renate Schubert, public authorities are often especially keen to ensure that their activities are not undermined by scientific studies: "Hence, researchers have to be careful and to avoid being unilaterally appropriated by a particular stakeholder group." Without mutual trust, collaboration with stakeholders is rarely successful. To establish trust, time is needed for exploration and exchange – and opportunities are needed to negotiate a common perspective as part of the collaborative process. The Collegium Helveticum can offer good conditions for this, because, under the current long-term research model, the work of its fellows is largely freed from the pressure for, and expectation of, rapid and rapidly exploitable results.

Digitalisation cannot be studied solely from desks or laboratories in universities.

At the Collegium Helveticum, project-based collaboration is not just important in the areas of research, development and consulting, but also in the area of basic research. Such collaboration – whether with public or private institutions – especially benefits from access to knowledge or data. Examples of this from the 2016–2020 research period are plentiful, and include for example collaboration with the telecommunications company Swisscom AG in the project *Privacy and the Value of*

Data (Renate Schubert), in the techno-historical study of the High-Performance Computing Center Stuttgart (HLRS) as part of the project *Autonomies in the Digital Society* (David Gugerli, Ricky Wichum), and collaboration with the PTT Archive as part of the *Digital Infrastructures* project (Monika Dommann, Hannes Rickli).

The Collegium Helveticum also has a foothold in stakeholder collaborations in the area of outreach and public relations. Two excellent examples of this are the Dialogue Festival, a two-day series of salon discussions about identities in digital times (2017), organised jointly with the Swiss National Museum in Zurich, and the *Privacy – Protected, Shared, Sold* exhibition (2019–2020), organised in cooperation with the City of Zurich, the Zurich Department of Culture, and the Zurich Department of Urban Development. More than 7,000 visitors converged on the Zurich town hall to learn about the past and present of this topic and gain insights into the academic debates surrounding it at the Collegium Helveticum.

"Caution is generally needed as a researcher to avoid being unilaterally appropriated by a particular stakeholder group."

Renate Schubert

Important cooperation with the sponsor institutions

The Collegium Helveticum also attaches great importance to cooperation with its fellows' home institutions, as well as with its three sponsor institutions. This is reflected in numerous conferences, workshops, lectures and panel discussions, which are held in concert with new and existing cooperative partners from the sponsor institutions, such as the University of Zurich's Department of Social Anthropology and Cultural Studies, ETH Zurich's Turing Centre, and the Zurich University

of the Arts's Institute for Contemporary Art Research. With this aim in mind, a recurring event is the Collegium's participation in Zurich secondary schools' triennial University Day – a joint venture of the HSGYM project with the secondary schools of the Canton of Zurich, the University of Zurich, ETH Zurich, the Zurich University of Teacher Education, the Zurich University of Applied Sciences, and the Zurich University of the Arts. The last University Day took place in 2018 and, in keeping with the theme of the 2016–2020 fellowship period, dealt with issues surrounding digitalisation as regards schooling and education at secondary schools and universities. Nikola Biller-Andorno , Monika Dommann, David Gugerli, Mike Martin and Renate Schubert represented the Collegium Helveticum at this occasion, presenting the fellows' perspective.

The Collegium Helveticum also engages in international scientific cooperation in partnership with the Network of European Institutes for Advanced Study (NetIAS) and the Network of University-Based Institutes for Advanced Study (UBIAS).

The full spectrum of cooperation practised at the Collegium Helveticum is broad, as are the types of institutions and the expertise of individuals involved. The Collegium Helveticum highly values the inter- and transdisciplinary skills that are such an important prerequisite for successful cooperation. This also includes recognising that such skills must be given a new perspective in the context of a concrete project. For this reason, it is also important to maintain and develop productive relationships and experiences with common forms of work and communication beyond the duration of each project. One of the Collegium Helveticum's key aims is to support this. *CR*

Collaborations

In its scientific work, the Collegium Helveticum seeks to interact and cooperate with other institutions. These include university research institutions in Switzerland and abroad, as well as stakeholders representing public administration, business or the cultural sector. Within such cooperative initiatives, independent projects have been developed and public events organised, through which the Collegium Helveticum has always served as a platform for discussing topics of importance to society. Furthermore, the Collegium Helveticum is well represented in national and international academic networks.

From 2016 to 2020, projects and events were organised in partnership with the following institutions and initiatives:

Projects

Mapping initiatives on digital societies together with the University of Zurich's Digital Society Initiative (DSI) and EvalueScience

The project, carried out in cooperation with the University of Zurich's Digital Society Initiative (DSI) and the consulting firm EvalueScience, compiled the first systematic overview of stakeholders in Switzerland who are tackling questions related to digital societies. The foundations for this were laid in partnership with consulting firm EvalueScience. The results were presented on the interactive website www.digitalsocieties.ch.

Privacy – Protected, Shared, Sold (exhibition) in cooperation with the City of Zurich's Department of Culture

Devised in cooperation with the City of Zurich's Department of Culture, the exhibition highlighted the key social, technical, legal, economic and ethical aspects of the topic of privacy and placed them in their historical context. The exhibition, curated by Sara Genner and Christian Ritter, was developed on the basis of the Collegium Helveticum's work on the cross-cutting topic of privacy and drew on the expertise and opinions of fellows from a variety of disciplines. Part of the exhibition was an interactive survey on privacy behaviour, developed in collaboration with the ETH Decision Science Laboratory. The exhibition and its accompanying fringe events took place from 19 September 2019 to 29 February 2020 at the Zurich town hall. With contributions by Nikola Biller-Andorno, Oliver Brägger, Monika Dommann, Sara Fabrikant, Sarah Genner, David Gugerli, Petros Koumoutsakos, Ioana Marinica, Mike Martin, Christian Ritter, Hartmut von Sass, Renate Schubert, Florent Thouvenin and Stefan Wehrli.

Events

Epistemologies of Aesthetic Practices (swissuniversities PhD programme)
University of Zurich, ETH Zurich and the Zurich University of the Arts

The Epistemologies of Aesthetic Practices research laboratory was created in response to a call to tender issued by swissuniversities for the development of cooperative doctoral programmes between academic universities and universities of applied science. The programme, which is hosted at the Collegium Helveticum, aims to develop joint research projects by bringing together and providing subject-specific support for outstanding dissertations on fundamental artistic, artistic-scientific and scientific questions in the field of aesthetics at the University of Zurich, ETH Zurich and the Zurich University of the Arts.

University of Freiburg
Institute of Cultural Anthropology and European Ethnology
Conference *Vernetzt, Entgrenzt, Prekär? Arbeit im Wandel und in gesellschaftlicher Diskussion – kulturwissenschaftliche Perspektiven.* (2018)

Deutsche Gesellschaft für Volkskunde
(Kommission Arbeitskulturenforschung)
Conference V*ernetzt, Entgrenzt, Prekär? Arbeit im Wandel und in gesellschaftlicher Diskussion – kulturwissenschaftliche Perspektiven.* (2018)

ETH Zurich
Computational Science and Engineering Laboratory (CSElab)
Lecture *Trolls, Bots, Social Media and Protests: Race and Democracy in the Age of Technology.*
Speaker: Leah Wright Rigueur (Harvard University). (2018)

Department of Chemistry and Applied Biosciences
Series *Diskussionsforen Collegium@Hönggerberg.* (2016/2017)

KOF Swiss Economic Institute
Panel discussion *Konjunkturprognosen zwischen Vergangenheit, Gegenwart und Zukunft.* With: Ronald Indergand (SECO), Marion Ronca (University of Zurich), Andreas Schönenberger (Health insurance Sanitas), Jan-Egbert Sturm (ETH Zurich). (2020)

Professorship for the history of technology
Workshop *Computer, Administration, and History.* (2018)

Conference *Geschichte des digitalen Zeitalters.* (2018)

Turing Centre
Conference *Geschichte des digitalen Zeitalters.* (2018)

Lecture *Big Data and Spurious Correlations.*
Speaker: Cristian S. Calude (University of Auckland). (2019)

Project HSGYM
(Middle schools in the canton of Zurich/University of Zurich/ETH Zurich/ZHdK/Zurich University of Teacher Education/Zurich University of Applied Sciences) Hochschultag der Zürcher Mittelschulen *Alles digital, oder was?* (2018)

Swiss National Museum
Dialogue Festival *Identitäten in digitalen Zeiten.* (2017)

Literaturhaus Zürich
Panel discussion *Wie lesen? Franco Morettis «Distant Reading» im Gespräch.* With: Monika Dommann (Fellow, University of Zurich), Michael Hagner (ETH Zurich), Thomas Hengartner (Collegium Helveticum), Albrecht Koschorke (Konstanz University Press), Franco Moretti (Stanford University), Gesa Schneider (Literaturhaus Zürich), Bernd Stiegler (University of Constance). (2016)

Plattform Digital Brainstorming
(Migros Kulturprozent)
Panal discussion *Good Hack – Bad Hack?*
With: Gleb J. Albert (University of Zurich), Ivan Bütler (Ethical Hacker, Compass Security), Marc Henauer (Federal Intelligence Service), Felix Stalder (ZHdK), Carmen Weisskopf and Domagoj Smoljo (artists, !Mediengruppe Bitnik). (2017)

Conference *Was ist digitale Kulturöffentlichkeit.* (2017)

Paulus-Akademie Zürich and Stiftung Science et Cité
Discussion series *Mensch nach Mass.* (2016/17)

Schauspielhaus Zürich
Audience discussion *Homo Faber.* With: Monika Dommann (Fellow, University of Zurich), Thomas Hengartner (Collegium Helveticum), Renate Schubert (Fellow, ETH Zurich). (2017)

Audience discussion *Weltzustand Davos (Staat 4).* With: Thomas Hengartner (Collegium Helveticum). (2018)

Introduction to the play *Hundeherz.*
With: Nikola Biller-Andorno (Fellow, University of Zurich). (2018)

Conference *Theater in der digitalen Gesellschaft.* (2018)

Schweizer Forum für Kommunikationsrecht
Conference *Digitale Kunst – künstliche und künstlerische Intelligenzen. Zu Herausforderungen für Kunst und Recht durch maschinelle Technologien.* (2019)

Swiss Study Foundation
Study week *Digital Societies. Curse or Blessing – or both?* With: Monika Dommann (Fellow, University of Zurich), Ioana Marinica (Collegium Helveticum), Renate Schubert (Fellow, ETH Zurich), Max Stadler (Collegium Helveticum) and Hartmut von Sass (Collegium Helveticum). (2018)

City of Zurich
Department of Culture
Exhibition *Privatheit – geschützt, geteilt, verkauft.* Curated by: Sarah Genner und Christian Ritter (both Collegium Helveticum). (2019/20)

Zurich Department of Urban Development and *Tages-Anzeiger*
Panel discussion *Smartes Zürich – Wie digital wollen wir sein?* With: Monika Dommann (Fellow, University of Zurich), Anna Schindler (Zurich Department of Urban Development), Judith Wittwer (*Tages-Anzeiger*), Nicolas Zahn (Operation Libero). (2019)

Filmpodium der Stadt Zürich
Screening *In my Room.* With: Sarah Genner, Christian Ritter (both Collegium Helveticum). (2019)

Screening *Rear Window.* With: Johannes Binotto (University of Zurich), Monika Dommann (Fellow, University of Zurich). (2019)

Université de Neuchâtel
Institut für Geografie
Panel discussion *Zivile Drohnen in der Schweiz: Anwendungen, Regulierungen und Imaginationen einer technischen Innovation.* (2018)

University of Zurich
Center for Information Technology, Society, and Law (ITSL)
Privacy talks *GDPR – an ideal approach to data protection?* Speaker: Niko Härting (Berlin School of Economics and Law). (2018)

Privacy talks *Die Datenschutz-Grundverordnung: Goldstandard oder Sackgasse?* Speaker: Winfried Veil (Data protection officer, Berlin). (2018)

Lunch talk *Security by Design – A Useful Regulatory Principle in the Service of Cybersecurity?* Speaker: Lee A. Bygrave (University of Oslo). (2019)

Center for Higher Education and Science Studies (CHESS)
CHESS lecture *Hochschulen im Medien- und Öffentlichkeitswandel: Aktuelle Herausforderungen.* Speaker: Otfried Jarren (University of Zurich). (2018)

Department of Social Anthropology and Cultural Studies (ISEK)
Workshop *Zusammenarbeit(en). Praktiken der Koordination, Kooperation und Repräsentation in kollaborativen Prozessen.* (2017)

Workshop *Drone Culture(s): National and International Spaces of Application, Imagination and Regulation of Civil Drones.* (2018)

Panel discussion *Zivile Drohnen in der Schweiz: Anwendungen, Regulierungen und Imaginationen einer technischen Innovation.* (2018)

Conference *Vernetzt, Entgrenzt, Prekär? Arbeit im Wandel und in gesellschaftlicher Diskussion – kulturwissenschaftliche Perspektiven.* (2018)

Institute of Biomedical Ethics and History of Medicine
Lecture *Clinical Ethics Forum I – Field: Psychiatry.* Speaker: Paul Hoff (University Hospital Zurich). (2016)

Lecture *Clinical Ethics Forum II – Field: Kidney Transplantation.* Speaker: Thomas Müller (University Hospital Zurich). (2016)

Lecture *Clinical Ethics Forum III – Field: Nursing.* Speaker: Birgit David (University Hospital Zurich). (2016)

Institute of Evolutionary Medicine
Symposium *Transdisciplinary Research on Ancient Mummified Tissue.* With: Salima Ikram (American University in Cairo), Albert Zink (EURAC Research, Bolzano). (2016)

Department of History
Workshop *Home Computer Subcultures and Society before the Internet Age.* (2017)

Panel discussion *Wie viel Geisteswissenschaft braucht die Gesellschaft?* With: Fathi Derder (Swiss National Council), Lino Guzzella (ETH Zurich), Walter Leimgruber (University of Basel), Min Li Marti (Swiss National Council). (2017)

Panel discussion *Konjunkturprognosen zwischen Vergangenheit, Gegenwart und Zukunft.*
With: Ronald Indergand (SECO), Marion Ronca (University of Zurich), Andreas Schönenberger (Health insurance Sanitas), Jan-Egbert Sturm (ETH Zurich). (2020)

Zentrum für Religion, Wirtschaft und Politik (ZRWP)
Conference *Joint Degree Masterstudiengang – Religion – Wirtschaft – Politik: Vernetzt denken.* (2017)

Zukunftskolleg of the University of Constance
EURIAS workshop *World Government or Else?* (2017)

Prize question *Disrupted Orders?* (2019)

Zurich-Basel Plant Science Center (University of Zurich, ETH Zurich, University of Basel)
Conference *Dialog Grün 2016: Neue Technologien im Pflanzenschutz – Eine Alternative zu Pestiziden.* (2016)

Zurich University of the Arts
Institute for Contemporary Art Research (IFCAR)
Tag der Forschung – Zürcher Hochschule der Künste. (2018)

Department of Cultural Analysis and Plattform Kulturpublizistik
Conference *Was ist digitale Kulturöffentlichkeit.* (2017)

Center for Cultural Law
Conference *Digitale Kunst – künstliche und künstlerische Intelligenzen. Zu Herausforderungen für Kunst und Recht durch maschinelle Technologien.* (2019)

Networks

Alongside its numerous project-related partnerships, the Collegium Helveticum is a member of the UBIAS (University-Based Institutes of Advanced Study) and NetIAS (Network of European of Institutes for Advanced Study) networks. As a member of NetIAS, Collegium Helveticum was also part of the European Institutes for Advanced Study (EURIAS) Fellowship Programme, funded by the Marie Curie Actions Research Fellowship Programme. Between 2015 and 2019, up to two academics worked at the Collegium Helveticum at the same time and benefited from the institution's transdisciplinary structures. The European programme ended in July 2019. The following EURIAS fellows worked at the Collegium Helveticum:

Dr Luigi Cellauro (2015/2016)
Palladio's 'Master and Guide': Vitruvius and the Quattro Libri

Dr Ingrid Hoelzl (2018/2019)
Post-Image: The New Ecology of Vision

Dr. Marcin Moskalewicz (2015/2016)
Pathologies of Temporality: Abnormal Experiences of Time in Mental-Psychological Disorders

Dr Ekaterina Nechaeva (2016/2017)
Fleeing and Staying: Military Deserters and Civil Fugitives from the Later Roman Empire

Professor Katariina Salmela-Aro
(University of Helsinki; 2018/2019)
Dynamics of Optimal Learning Moments

Professor Moshe Semyonov (2015/2016)
The Integration of Immigrants as a Multidimensional Phenomenon: A Comparative Analysis

Dr Attila Tanyi (2016/2017)
Consequentialism and Its Demands: The Role of Institutions

Associate Professor Aleš Završnik (2017/2018)
Big Data and the Fight Against Crime: The Dangers of 'Algorithmic Justice'

Professor Walther Ch. Zimmerli (2017/2018)
Knowledge Means Action. A Transdisciplinary Theory of Digital Civilisation

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Thomas Hengartner (1960–2018)

Thomas Hengartner became Director of the Collegium Helveticum in early 2016. Together with the newly appointed fellows, he selected Digital Societies as the main theme for the Collegium Helveticum's 2016–2020 fellowship period – knowing that this reflects a key development and challenge in our society today. He was convinced that a transdisciplinary approach would not only be fruitful for this topic, but was an absolute necessity – and he believed that the Collegium Helveticum provided the perfect setting for such work.

Transdisciplinary work was always both a priority and a passion for him throughout his academic career. Born in St. Gallen in 1960, Hengartner studied classical anthropology and dialectology at the University of Bern, and was also at home in the transdisciplinary nexus of history and literature. He liked to quote Francis Picabias, who said that "our heads are round so our thoughts can change direction", a notion symbolic of his research activities. Hengartner was a lateral thinker and overcame disciplinary boundaries time and again. He embarked on his first professorship at the University of Hamburg in 1996, where he made a name for himself with his research into our interactions with telecommunications, addictive substances and religiosity. In 2002, Hengartner was awarded the German Research Foundation's prestigious Leibniz Prize. In 2010, he accepted a position at the University of Zurich, where he subsequently became a full professor of anthropology and Head of the Institute for Popular Cultures. The researcher later became a board member of the newly founded Department of Social Anthropology and Cultural Studies (ISEK) in 2014. Hengartner's academic work in Zurich focused on urban life, and he set major new standards with his analysis and interpretation of the relationship between technology, culture and everyday life. In addition to urban research and the investigation of new communicative practices, one of his main areas of focus was the cultural study of technology.

Given his cross-disciplinary background, it was no coincidence that he was appointed Head of the Collegium Helveticum, the laboratory for transdisciplinary research, in 2016. Following the involvement of the Zurich University of the Arts under Hengartner, the Collegium Helveticum enjoyed a major expansion, while art in a transdisciplinary context finally received the attention it deserved.

The illness he believed he had beaten returned in autumn 2017 and sadly prevented him from enjoying the fruits of his labours alongside the Collegium's fellows. He passed away on 10 May 2018 at the age of 57. *MS*

Thomas Hengartner 1960–2018

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