Connecting Crime in a Borderless Digital World

Cybercrime illustrates how quickly complexity can grow in a digitalized world: a single person using a computer – or AI – can cause massive damage to many people across borders, while investigative tools struggle to adapt to rapidly evolving technologies. "Criminals adopt new technologies very quickly, often faster than authorities," says Bernhard Haslhofer. To address this gap, law enforcement needs new analytical methods and forums where technical and investigative expertise meet. The INTERPOL New Technology Forum 2025, which Haslhofer co-hosted together with the INTERPOL Innovation Centre and the Bavarian State Ministry of Justice in September, serves as a leading platform for these discussions. The event focused on how emerging technologies can strengthen global security.

Haslhofer's research shows how science contributes to this effort. His team develops methods to trace cryptocurrency payment flows and visualize transaction networks. "Because illegal activities, such as arms trafficking or the distribution of abusive material on the darknet, are often conducted via cryptocurrencies, this technology can help investigators connect individual cases and target criminals more effectively. Digital forensic tools like these are essential to keep pace in a digitalized world," he explains.

Tracing Innovation in a Rapidly Changing World

Technological change is already reshaping labor markets – at a pace that may be faster than ever before. How can countries and regions do more than simply react, and instead prepare for what lies ahead?

Some pieces of this puzzle are being explored by Frank Neffke, who was awarded the 2025 netidee SCIENCE grant. He will investigate why software development remains concentrated in just a few regions despite global digital cooperation. His work traces how innovation spreads and how industries gain or lose competitive advantage, revealing the dynamics that shape regional and global economies.

Ljubica Nedelkoska is working on another piece of the puzzle – understanding how these changes affect people's work-lives.

She points out that we still do not know what the jobs of the future will look like or which types of work may disappear. "If AI radically changes the dynamics between job loss and job creation, current policies will no longer be sufficient."

If innovation moves faster than policy, which regions – and which workers – will thrive in the jobs of tomorrow? The hope is that research like this will guide policies that keep up with change.

Investigating the Forces Behind a Polarized World

Why has polarization in Western democracies increased so sharply? Stefan Thurner, Markus Hofer, and Jan Korbel explored this question in a study published in *PNAS* – and they may have uncovered part of the answer.

Between 2008 and 2010, a period when smartphones and Facebook became more and more widespread, societal polarization rose abruptly. At the same time, survey data from Europe and the US indicate that the number of close social contacts roughly doubled. In other words, polarization grew at the same time that people became more connected socially. Using a mathematical network model of friendships in societies, the researchers suggest a mechanism that may at first seem paradoxical: increasing connectivity – more links within social networks – crosses a tipping point once a certain number of close friendships is exceeded. Beyond this point, a sudden surge in polarization becomes, in a sense, unavoidable, similar to a phase transition in physics, such as water turning into ice.

Spotlights

The Power of Visualization
When it comes to making complex topics clear and accessible to everyone, words alone often fall short. Images help – but interactive visualizations are even better.

That's why we are especially thrilled that the work of CSH data visualization expert Liuhuaying Yang has been recognized this year with both the City of Vienna's Förderpreis and the Information is Beautiful Award. In addition, one of her projects, the Zoonotic Web, based on the research of Amélie Desvars-Larrive, is currently on display at the Wien Museum.

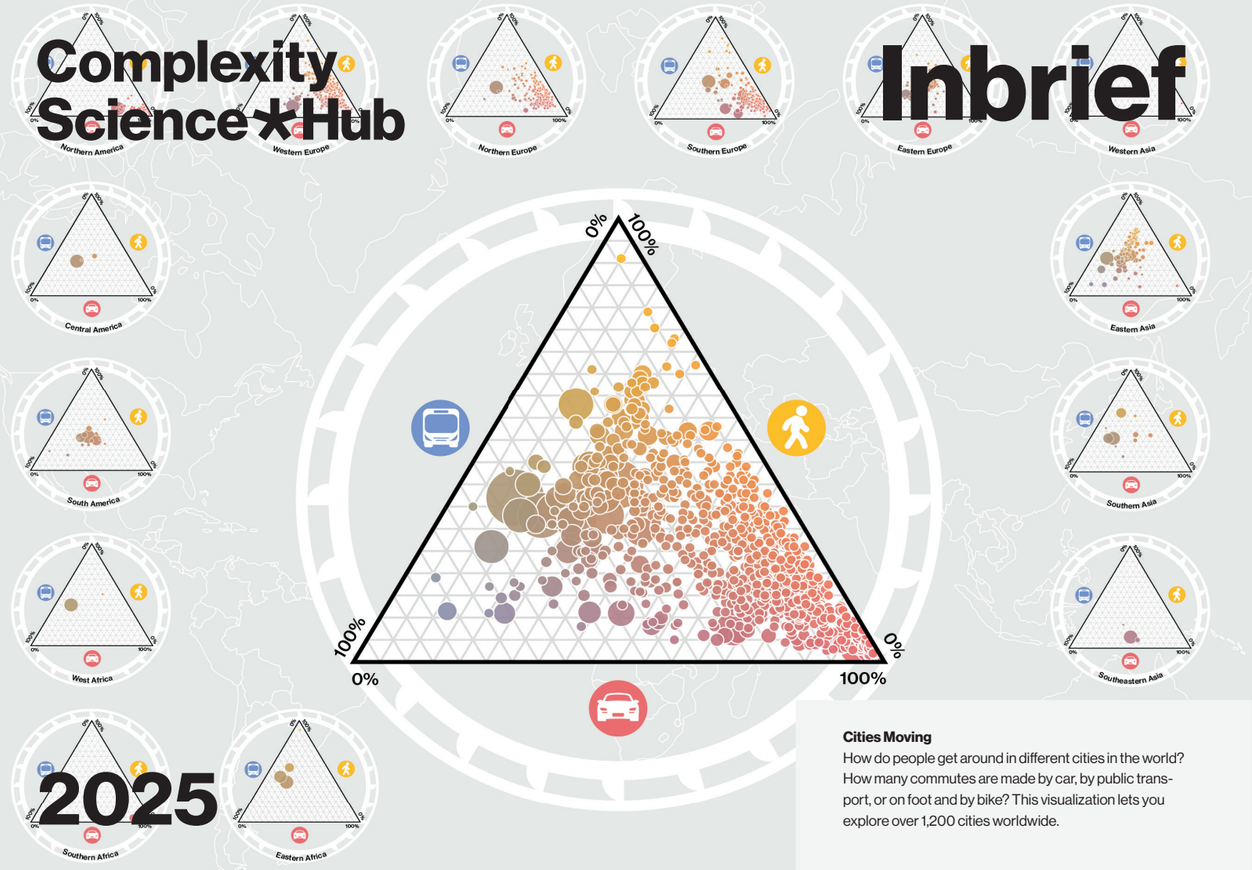
Giordano Bruno
Since June, the Giordano Bruno sculpture has marked the entrance to our Palais Springer-Rothschild. Created by Alexander Polzin and gifted by the Central European University, it depicts the Renaissance philosopher and stands as a monument of a value that remains crucial today: the freedom of science.

Spotlight On
What drives our researchers? What impact do they hope to make? Get a behind-the-scenes look in the new Spotlight On series, featuring interviews with a twist. Explore it here: csh.ac.at/events-news/news/

Two New Books
This year, Peter Turchin published two new books: *The Great Holocene Transformation* and *Seshat History of Moralizing Religion*.

The first focuses on an apparent paradox: that conflict and competition have often been driving forces behind ever-greater scales of cooperation. The second examines "moralizing religions," a powerful force shaping human history.

Imprint
Complexity Science Hub, Metternichgasse 8, 1030 Wien
Texts: Anja Böck



Cities Moving
How do people get around in different cities in the world? How many commutes are made by car, by public transport, or on foot and by bike? This visualization lets you explore over 1,200 cities worldwide.

Inbrief

Complexity Is Everywhere.

Editorial
Stefan Thurner

If the past year has shown us anything, it is this: complexity is not a niche topic for academics. It is the operating system of our world. And 2025 has delivered more than enough reminders of what happens when we try to run this operating system with shortcuts and simple stories. Whether we look at supply chains and their vulnerabilities, the governance of rapidly advancing AI systems (where global alignment is urgently needed yet still far from reality), election forecasting, and the persistent limits of predicting human behavior, or the challenges in health care, cybersecurity, and mobility – we saw pretty much the same pattern everywhere: high expectations for simple answers, confronted with systems that stubbornly refuse to be simple.

Complexity science does not make the world simpler. But it does make it more understandable. What we do at the CSH is to try to uncover the structure behind the chaos: the networks that shape behavior, the interactions that generate surprises, and the dynamics that determine whether systems are robust or fragile. Once we see these hidden mechanics, we can start asking meaningful questions. How will the system respond if we change something? Which parts matter? Which parts don't? And which parts don't matter – until suddenly they do?

That the world is complex does not mean we should avoid making decisions. Rather, our research aims to provide a solid foundation for better decisions – not based on intuition, but on real understanding. This year, we continued to apply this lens in many directions. We hosted the INTERPOL New Technologies Forum, where law enforcement agencies from all over the world came together to discuss how to confront exploding cybercrime with tools that can actually keep up. We wrote a strategy paper for the European Parliament on dependencies, resilience, and competitiveness in European Union's supply chains and presented it in Brussels. We spoke with media across the globe about polarization, climate impacts on health, migration, and all the other issues where "more data" is not enough, but understanding the system is. We also welcomed new young researchers – talents who want to learn how complex systems really work, and who, I hope, will become the digital leaders we urgently need. Leaders who can move between research, policy, administration, and the economy, because the problems ahead do not respect disciplinary boundaries.

Beyond that, and because it's important not to forget about the good, we celebrated, too. We finally arrived in our new home at Palais Springer-Rothschild and threw a party for science. Our researchers won awards and grants that enables them to continue their important work. And we were reminded – once again – why doing complexity science is worth the effort: because it gives us a chance to understand what is actually going on. And because understanding is still the best starting point for changing anything.

The Complexity Science Hub in 2025

84 Resident Scientists

+ 89 external, 45 associate and 80+ visitors

32% women
68% men

31 nationalities

Education

- CSH Digital Innovation School with 12 PhD students in the Graduate Program & 6 Postdocs in the Postdoc Program
- 6 summer interns & 26 visiting students
- 22 winter school participants

160+ Publications

- PNAS
- Nature
- Nature Human Behaviour
- Nature Communications
- npj Urban Sustainability
- Strategy paper for the European Parliament and more

3,600+ Media Appearances

- +40% stories
- *The Guardian, Bloomberg, The Economist, El País, Nature, NZZ, Die Zeit, FAZ, SZ*, and more
- 4 journalists in residence
- 15K followers on social media
- 120K+ website users

Funders & Partners

- Austrian Academy of Sciences
- Austrian Research Promotion Agency (FFG)
- Austrian Science Fund (FWF)
- City of Vienna
- Epigenes
- European Research Council (ERC)
- European Commission
- Federal Chancellery of Austria
- Federal Ministry of Agriculture and Forestry, Climate and Environmental Protection, Regions and Water Management
- Federal Ministry of Economy, Energy, and Tourism
- Federal Ministry of Innovation, Mobility, and Infrastructure
- Federal Ministry of the Interior
- Federal Ministry of Women, Science, and Research
- Harvard Growth Lab
- netidee SCIENCE
- NOMIS Foundation
- Oesterreichische Nationalbank
- The Alan Turing Institute
- UBS Optimus Foundation
- University of Hong Kong
- University of North Carolina
- voestalpine
- WWTF

14 Research Topics

- Foundations of Complex Systems
- Collective Minds
- Human Migration
- Social Complexity & Collapse
- Crime in the Digital Age
- Urban Sustainability
- Transforming Economies
- Algorithmic Fairness
- AI & Machine Learning
- Digital Currency Ecosystems
- Supply Chain Science
- Healthcare & Medicine
- Health Across Species
- Data Analytics

170+ Events

- Grand opening of our new location
- INTERPOL New Technologies Forum (100 participants)
- Panel discussions, including Nobel laureate Didier Queloz
- AI workshop at the Oesterreichische Nationalbank (OeNB)
- Winter School
- School workshops
- Art & Science exhibitions

27 Research Projects

- Economic and societal transitions
- Future of work
- One Health
- Supply chains
- Misinformation
- Collective adaptation and more

11 Members

- AIT Austrian Institute of Technology
- BOKU University
- Central European University (CEU)
- Graz University of Technology
- IT:U Interdisciplinary Transformation University Austria
- Medical University of Vienna
- TU Wien
- University for Continuing Education Krems
- Vetmeduni Vienna
- Vienna University of Economics and Business (WU)
- Austrian Federal Economic Chamber (WKO)

Awards

- Liuhuaying Yang: Information is Beautiful Award & Förderpreis of the City of Vienna
- Frank Neffke: netidee SCIENCE Award from the Internet Stiftung, granted through the FWF
- Peter Klimek: Schiefer Award 2025