

# Where Big Data Starts to Make Sense

*Its research fields and subjects; its methods and data used; the multitude of scientific backgrounds of its people; the broad range of findings: The Complexity Science Hub Vienna is a whole universe(ity) in one small place.*



## Welcome!

Welcome, everybody, to the Complexity Science Hub Vienna | the CSH | “the Hub”: A place where, as we believe, Big Data starts to make sense!

## Big Data

In one way or the other, science has always been data-driven. How good, then, that we have data in unprecedented quantity and (sometimes) quality today, zillions of bits and bytes, collected about everything and anywhere in the world... don't you agree?

Data, Big Data: the “gold of the 21st century!”

Yet, here is the drawback: Data alone will not enlighten us. Although simple if-then correlations drawn from observations might well create Eureka effects, the challenges humankind faces today, some of them probably the biggest threats in *Homines sapien-tes*’ short history, require a totally new approach to science.

Above all, we need to accept that addressing the overwhelmingly intertwined problems of our time requires nothing less than to face, and to embrace, the governing principle of about anything that happens and moves on this planet: complexity.

To address complexity, we need complexity science. This is where the Hub enters the scene.

## BD for Big Questions

With the help of large, comprehensive datasets, the CSH is willing to approach big, that is, complex questions: What are the effects of financial turbulences on society? How will urbanization change the economy/democracy/our need for resources? How will digitization/ the growing number of natural disasters/fake news/migration/ a pandemic influence humanistic values/economies/medicine? And the perhaps biggest of all BQs: How can our species finally learn to manage the complexity around it in an ecologically, socially, and economically sound way?

## BD+BQ need Big Theory

If we are aiming to gain such far-reaching insights into the networks (of networks), to gain insights into systemic risks, resilience, tipping points, or the efficiency of complex systems—into all these Big Qs that were unintelligible only a few decades ago—simplification, the means of choice in science for centuries, will no longer do.

BD+BQs need Big Theory!

The science of complex systems provides us with the necessary new mathematical and statistical tools—some of them are being developed at the Hub.

## BD+BQ+BT won't work without Big Talent

To come that far, we need people who have rigorous training in a relevant discipline, as well as quantitative, mathematical, modelling, and data expertise. The limited number of such people is a major (and worldwide!) bottleneck. At the CSH, we are therefore aiming not only to attract, but also to train young and highly talented people to become such experts: true “masters of Big Data.”

Many scientists working at the Hub are skilled in more than one discipline (they certainly work in more than one). Such a broad knowledge base facilitates collaboration across disciplines inside the house and beyond, and forms the basis for developing discipline-crossing ideas in discipline-crossing workshops and conferences in order to eventually push disciplinary boundaries. “Only scientific excellence will bring us forward,” Stefan Thurner, CSH co-founder and President, once said. “The Hub will only be successful if we are able to attract, to train, and to work together with the most creative, sparkling, brilliant people; to leave the beaten tracks together, daring to enter new scientific grounds.”

## BD+BQ+BT2 → Findings for the benefit of society

With all these big requirements fulfilled, the Hub is hopeful to reach a deeper understanding of complex systems and their networks (of networks). We build agent-based models to simulate reactions and (unintended) consequences of interventions without the immense costs of real-life trial and error, to identify a system's tipping points, or to specify requirements for alternative pathways... in other words: to generate an impact and a benefit for society.