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Understanding Science 2.0:
Crowdsourcing and Open Innovation in the Scientific Method

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Modern Science is Collective Intelligence

The lonely researcher trying to crack a problem in her office still plays an important role in fundamental research. However, modern research activities and projects involve intensive interactions, often among participants from different fields. Large project conglomerates (e.g., EU-funded research or projects funded through the Advanced Technology Program in the U.S.) increase the number of such interactions. In many cases, the scientist groups self-organize their work and contributions according to their individual strengths and skills (and other measures) to reach a common research goal, without a strong centralized body of control.
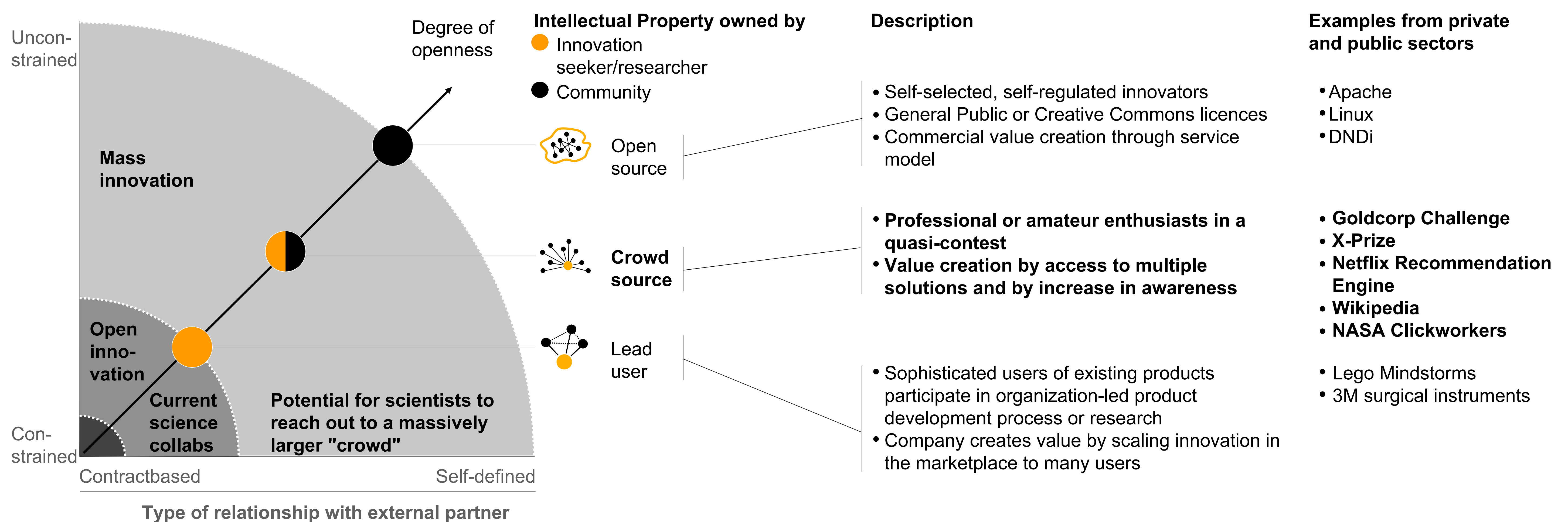
If basic science has become a collective intelligence effort, can it use the ideas and technologies from Crowdsourcing and Open Innovation to spend money more efficiently and effectively? Will scientific work undergo fundamental changes?

What is Crowdsourcing and Open/Mass Innovation?

"Crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call." (Howe 2008 and 2010)

"Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology. Open Innovation combines internal and external ideas into architectures and systems whose requirements are defined by a business model." (Chesbrough 2003)

Intellectual Property owned by
🟠 Innovation seeker/researcher
⚫ Community

| Type	Description	Examples from private and public sectors
Open source	• Self-selected, self-regulated innovators • General Public or Creative Commons licences • Commercial value creation through service model	• Apache • Linux • DNDi
Crowd source	• **Professional or amateur enthusiasts in a quasi-contest** • **Value creation by access to multiple solutions and by increase in awareness**	• **Goldcorp Challenge** • **X-Prize** • **Netflix Recommendation Engine** • **Wikipedia** • **NASA Clickworkers**
Lead user	• Sophisticated users of existing products participate in organization-led product development process or research • Company creates value by scaling innovation in the marketplace to many users	• Lego Mindstorms • 3M surgical instruments

A New Approach for Research at Universities?

In order to investigate "basic science" in a structured manner, we have simplified the tasks that are conducted in most scientific inquiries (see figure to the right) and used the "Collective Intelligence Gene" framework (Malone et. al. 2009) to analyze the tasks in combination with the "Three Constituents Principle" from AI (see figure below). See (Buecheler et. al. 2010) for details.

Based on this categorization and taxonomy, we hypothesize that the following scientific tasks are especially suited for Crowdsourcing: Develop and choose methodology, identify team of co-workers, gather information and resources (prior work and implications), analyze data, retest .
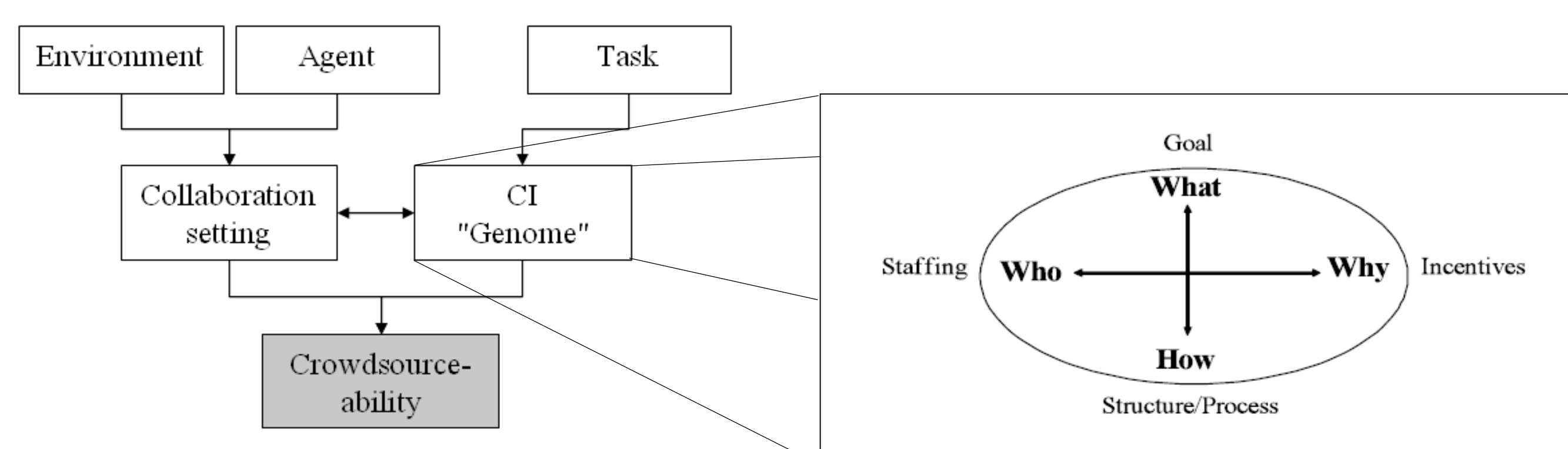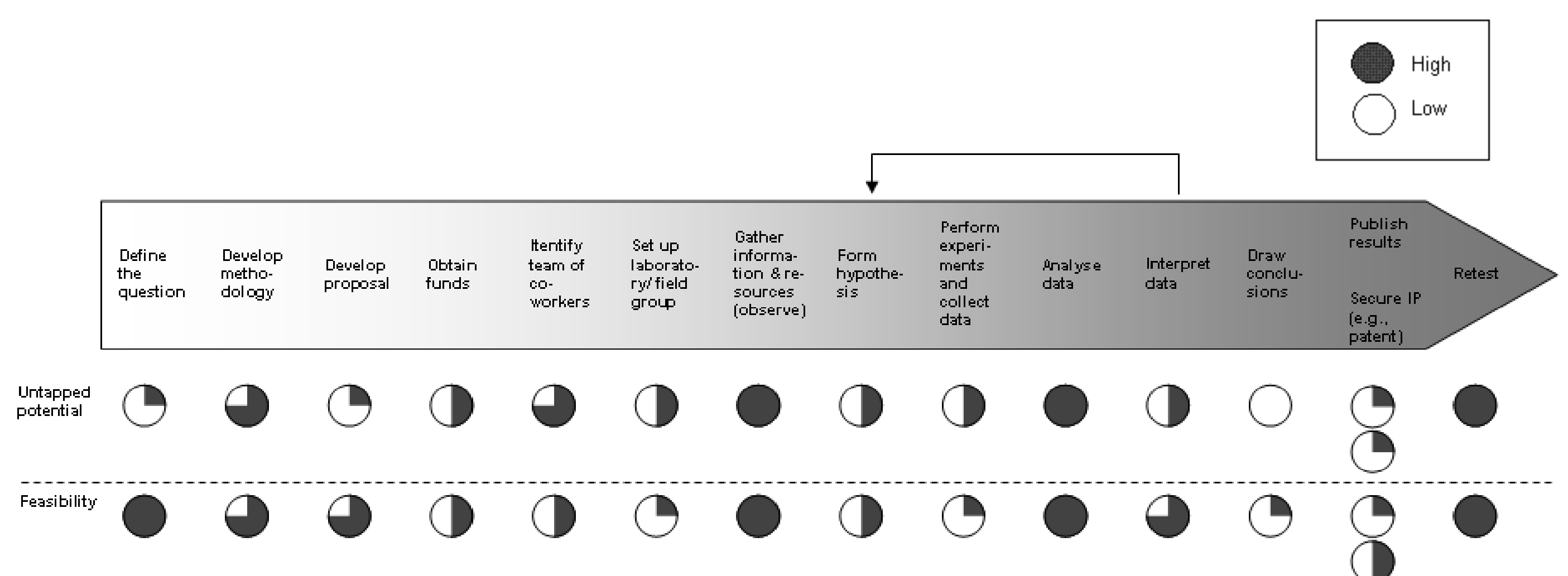
The research team started analyzing extensive data gathered in two rounds from 279 individuals participating in two university Crowdsourcing contests (18 research projects). In parallel, the team has started implementing a simulator for testing the identified local rules of interaction in such a Crowdsourcing/Open Innovation context and other findings, comparing them to empirical data from other disciplines (e.g., management science). In addition, this simulator allows to better understand sensitivities of parameters that researchers can set/influence and therefore might have predictive power.
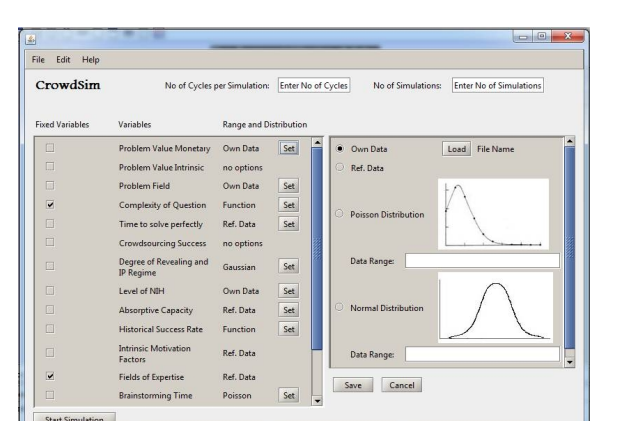
Are There Any Limitations?

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Do you know science fields where the above frameworks are not applicable at all?
What are your hypotheses regarding Crowdsourcing for university research groups?
You want to be part of this?
→ Talk to me: buecheler@ifi.uzh.ch