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## Ginkgo Bioworks Public Policy Fellowship Essay

Synthetic biology promises to transform the way we build the world by democratizing and accelerating the design of new organisms. That revolution will be driven not by lone scientists and inventors but by teams composed of diverse contributors. Their success or failure depends on whether they can effectively divide, coordinate and integration their labor—and yet we know frustratingly little about how to do so. Across academic, industrial and open science we rely on folk theories and speculation to organize our work. History is full of promising ideas that died from organizational incompetence. We can do better.

My goal is to uncover the organizational roots of innovation and use that knowledge to engineer teams and ecosystems that make the most of their resources and contributors. Specifically, I would fellowship to fund two projects during Summer 2022 in pursuit of that goal.

The first project studies how social interactions can be harnessed to overcome self-reinforcing inequality. Success-breeds-success dynamics are common in real world markets. Initial differences become amplified over time through multiple mechanisms, locking initially unsuccessful actors—even if by chance—into a cycle of failure from which it is nearly impossible to recover. Helping early failures overcome the lock-in effect is critical for their own viability and for the growth of the markets in which they are embedded. Network interventions (that drive improvement through interactions with high performing peers) are a theoretically promising solution but their effects are extremely difficult to causally identify. I will develop and apply new statistical techniques to data from the iGEM synthetic biology competition to understand whether network interventions can be used to overcome the lock-in effect and provide guidance on their design.

The second project examines how affects team structure and performance. Teams are rarely formed from complete strangers but from a mix of new and old faces. Familiar collaborators track the informal residue of their previous interactions into their current teams. This seems likely to affect their organizational structure—who does what with who—but remains unclear if and how this occurs. Does familiarity help teams organize more efficiently or contort them into ineffective shapes? This is hard to answer because we rarely observe individual histories, team organization and innovation

performance at once. With this fellowship I could design and implement surveys that complement existing iGEM data allowing me to answer that question.

I envision three outputs for these projects. First, their results will help guide future teams in iGEM and elsewhere, directly accelerating innovation in synthetic biology. Second, they will be submitted for publication at high visibility scientific journals to disseminate our findings and help me get a job. Third, if useful for Ginkgo, I would like to present these results for the company either virtually or in Boston.

I hope that this essay along with my curriculum vitae makes a strong case on my behalf and look forward to hearing your decision. I love your company and hope this is the start of a long and fruitful relationship.

Sincerely,  
Robert Ward