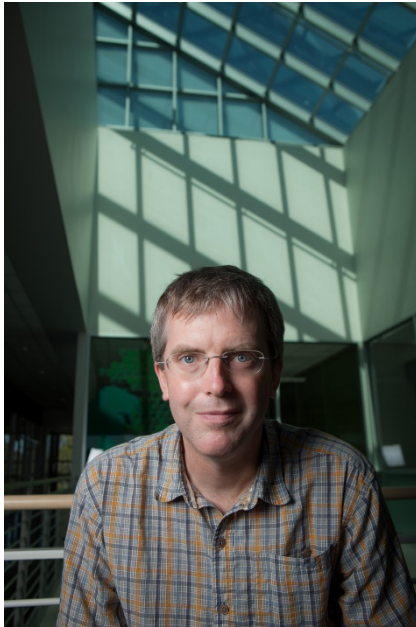


## Securing Operational Mastery of Living Matter

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### **Abstract**

The capacity to construct and operate organisms from defined molecules without constraint to natural lineage or artificial environment will mark the start of a new era for biology and everything life impacts. Two complementary approaches have and are being pursued, natural lineage minimization and bottom-up synthesis. Minimization approaches have, for over 20 years, encountered the puzzle of "essential genes of unknown function." Synthetic approaches are beginning to acknowledge the complementary puzzle of "essential functions that are unknown" and have already encountered the challenge of "insufficient autocatalysis." Stated differently, we collectively know enough about what we do not know to systematically approach the challenge of constructing cells that we can understand. I will explore what methods and ways of working are most likely to ensure that the US research community has a chance to cross the finish line first and keep going.

### **Bionote**

Drew Endy serves as Associate Chair, Education for Stanford Bioengineering. His research teams pioneered amplifying genetic logic, rewritable DNA data storage, reliably-reuseable standard biological parts, and genome refactoring. Drew helped launch the new undergraduate majors in bioengineering at both MIT and Stanford; he also co-founded the iGEM competition, a global genetic engineering "olympics" now engaging thousands of students annually ([www.igem.org](http://www.igem.org)). In 2013 the White House recognized Drew for his work on open-source biotechnology and, more recently, he received an honorary doctorate from the Technische Universiteit Delft. Drew has served on the US National Science Advisory Board for Biosecurity (NSABB) and the standing Committee on Science, Technology, & Law (CSTL); he currently serves on the World Health Organization (WHO) Smallpox Advisory Committee and the International Union for the Conservation of Nature (IUCN) Task Force on Synthetic Biology and Biodiversity Conservation. Drew was a co-founder of Gen9, Inc., a DNA construction company; he returned to serve as a director while Gen9 was successfully acquired. Drew worked briefly with the Rapid Evaluation team at Google [X] and also served on the building project team for the Shriram Center at Stanford. He is a founding co-director of the NIST/Stanford Joint Initiative for Metrology in Biology ([jim.stanford.edu](http://jim.stanford.edu)). Esquire