

## **Proposed strategic growth for Rice in the area of Synthetic Biology**

Rice is uniquely situated to enjoy large returns on investments in the research area of Synthetic Biology. Synthetic Biology is a new but rapidly advancing research area where engineering principles are being applied to living organisms, with major applications in medicine, energy, manufacturing, energy, and basic science. Publication rates, federal and private funding, start-up ventures, and corporate investments in Synthetic Biology are all seeing major increases. Furthermore, the landscape in Synthetic Biology presents a major opportunity. MIT and UC-Berkeley have established themselves as the two leaders in this area, and there are about one dozen other universities, including Rice, that could move into that upper echelon with proper growth. In particular, Rice has a groundswell of junior talent in Synthetic Biology, in particular Jeff Tabor (Assistant Professor, BioE), Matthew Bennett (Assistant Professor, BCB), and Laura Segatori (Associate Professor, ChemE).

Though these junior faculty are outstanding, they are too young to lead major initiatives, such as federal center grants. The hire of two world-class senior Synthetic Biologists would pay immediate dividends through a sharp increase in Rice's international visibility and reputation in this cutting edge area. CPRIT could be fully leveraged to increase competitiveness for the hires. In addition, the establishment of a Rice Synthetic Biology Center (SBC) with equipment, research and administrative support staff, and funding for internal initiatives would allow Rice to compete for world-class senior hires. Such a center would also support the coordination and administration of federal center and training grants and other major programmatic opportunities.

MIT recently made itself an upper echelon Synthetic Biology institution with two senior hires and a center. In particular, MIT Biological Engineering hired Chris Voigt (from UCSF) and Ron Weiss (from Princeton) and founded the MIT Synthetic Biology Center. MIT then rapidly secured a ~\$30M DARPA '1000 molecules' and NIH P50 center grant among other major programs.

There is a major federal funding trend toward Synthetic Biology. Following the "National Bio-Economy Blueprint" published by the White House in April 2012, the NIH initiated its first program for Synthetic Biology (genomes to natural products (U01)), which complements its major investments in the sister field of Systems Biology. Synthetic Biology has also been identified as a strategic investment area for the DOD. For example, DARPA announced the \$200M "Living Foundries" program in 2011 to a new bio-manufacturing industry in the United States and established a new Biological Technologies Office (BTO) in 2014. The ONR also has multiple programs in Synthetic Biology. Rice's Jeff Tabor is a part of the DARPA Living Foundries Program, a part of an ONR MURI program and recently received an ONR Young Investigator Award. The DOE is also funding Synthetic Biology in a large way through the Joint BioEnergy Institute (JBEI) in Emeryville, CA, and the Advanced Research Projects in Energy (ARPA-E) program, headed by Ramon Gonzales (Rice ChemE). NSF funded the Synthetic Biology Engineering Research Center (SynBERC) in 2006, of which Tabor is a part, and recently established a standing Synthetic Biology panel. Synthetic biology start-up companies are being established at an ever increasing pace in California and Boston and are now beginning to be publically traded. The pharmaceutical industry is shifting investments away from chemical synthesis and toward bio-manufactured drugs, as evidenced by the new Pfizer-MIT partnership in Synthetic Biology. Indeed, Rice's

largest grossing intellectual property is a genetically engineered succinate producing *E. coli* strain.