



# Leveraging biotechnology design principles to advance brain understanding and improve biotechnological device efficiency and scalability

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## Question

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## Introduction

The field of Biodesign holds immense potential in transforming our understanding of the brain and enhancing the capabilities of biotech devices. Over the past decade, this interdisciplinary area has experienced rapid growth, driven by pioneering research, the rise of design-focused biotech startups, and the expansion of educational programs globally.

## Biodesign and the brain

The brain, an extraordinarily complex organ with billions of interconnected neurons, presents a unique challenge for scientific exploration. Biodesign principles offer innovative tools and methodologies for studying the brain. For instance, bioengineered neural network models can provide valuable insights into brain function and disorders. Additionally, biodesign approaches enable the creation of advanced neuroimaging techniques for real-time observation of neural activity.

## Enhancing biotechnological devices

Biodesign principles can significantly improve the performance and scalability of biotech devices. By integrating biological systems with technology, we can develop devices that are more adaptable, efficient, and capable of self-repair. For example, neuromorphic algorithms and circuits inspired by the brain can enhance the computational capabilities and energy efficiency of processors, while biomimetic materials can improve the durability and functionality of biotech devices.

## Challenges and opportunities

Despite its vast potential, the field of biodesign faces several challenges. There is a lack of well-structured frameworks for sharing unique applications, foundational knowledge, and practical skills with newcomers. Access to best practices, material resources, and teaching strategies is unevenly distributed. To nurture a new generation of Biodesigners, it is essential to establish a consensus on biodesign pedagogy, practice, and theory, and to inspire a broader range of individuals and groups to embrace biodesign learning approaches.

## Conclusion

The application of biodesign principles can greatly advance our understanding of the brain and enhance the performance and scalability of biotech devices. As we continue to explore the potential of biodesign, it is crucial to cultivate an inclusive and diverse community of Biodesigners, equipped with the necessary knowledge, skills, and resources to propel this exciting field forward. By doing so, we can unlock new frontiers in brain research and pave the way for groundbreaking advancements in biotechnology.

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**Competing interests.** The authors have no conflict of interest.