

# From Cells to Circuits: The New Era of Bioelectronic to Decode Biology

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## Kiana Aran

UC San Diego, San Diego, USA

[karan@ucsd.edu](mailto:karan@ucsd.edu)

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The seamless integration of biology with modern electronics is redefining how we study, diagnose, and treat disease. In this new era of bioelectronic precision medicine, advances in two-dimensional (2D) materials such as graphene are enabling direct electronic interfaces with biological molecules, cells, and tissues, transforming the way we decode life's processes. Dr. Kiana Aran will present how her lab is harnessing these innovations to develop next-generation bioelectronic platforms. She will present CRISPR-Chip—a pioneering electronic biosensor that utilizes CRISPR systems anchored to graphene field-effect transistors (gFETs) for amplification-free genetic detection [1] as well as gene editing quality formulation control assessments. She will also talk about a comprehensive suite of graphene-based biosensors. These include multiomics transistors capable of simultaneous antigen and viral RNA detection for rapid pandemic response [2], gFETs for continuous monitoring of inflammation and cancer biomarker and real-time biomanufacturing sensors for tracking glucose, pH, and antibody levels in cell cultures [3].

Furthermore, Dr. Aran will share insights from her extensive commercialization journey, including the translation of these technologies into market-ready platforms through her startups [4]. Notably, her company Cardea Bio was acquired by Paragraf, enabling the commercial availability of graphene-based biosensors alongside integrated reader systems, making these advanced bioelectronic tools accessible to researchers and industry. The transition from bench to bedside highlights the transformative potential of merging molecular biology with nanomaterial electronics to create scalable, high-impact diagnostic technologies that advance precision medicine.

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## References

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