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# Editorial: Thought leaders in sensor research: volume 1

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## KEYWORDS

sensor research and innovation, nanosensors, internet of biochemical things, challenges and opportunities, fluorescence sensing, big data, artificial intelligence

## Editorial on the Research Topic

### Thought leaders in sensor research: volume 1

The Frontiers in Sensors “Thought Leaders in Sensor Research” article Research Topic represents a new type of resource distinct from conventional research papers that describe the outputs of laboratory endeavour or review papers that summarise the published literature of a particular Research Topic. The concept behind the Thought Leaders initiative is to gather together the thoughts of established and emerging thought leaders in sensor science and engineering, both in terms of advances in fundamental science underpinning research that could form the basis of revolutionary breakthroughs, and the challenges that must be overcome if sensing technologies are to realise their potential to improve our world. Over time, the Thought Leaders Research Topic will grow to become a global resource, stimulating debate, identifying key challenges, influencing investment policies for agencies and Governments. Our ambition is to provide a unique forward-looking strategic perspective, provided by leaders in sensor research and innovation with decades of experience and whose contributions to their field have been of the highest quality throughout their careers. In this way, we will create a resource of unique value to researchers and innovators alike, a resource that will grow, encourage debate, and ultimately inspire the next-generation of researchers. As this resource grows, it will set a vision for the future of sensor research and innovation, identifying critically important barriers that stand between the tremendous potential of the broad sweep of sensing technologies, and their ability to deliver huge advances in health diagnostics, environmental monitoring, food quality assurance, agricultural and industrial production, and the embedded sensing underpinning the entire “internet of things” service industry upon which society is increasingly dependent.

I am delighted to announce the first Volume of four contributing articles to the Thought Leaders Research Topic, drawn from established and emerging researchers in sensor science and innovation, and covering diverse Research Topic of critical importance to the future development of the field. In their article “Sensing and Biosensing in the World of Autonomous Machines and Intelligent Systems”, [Oliveira and Oliveira](#) examine the convergence of nanotechnology and artificial intelligence, and discuss how nanotech-based sensors and biosensors are providing the data for autonomous machines and intelligent systems. This is a Research Topic that is certain to grow massively in importance in the coming years, due to the tremendous potential of nanotechnology to revolutionise the range and scale of sensor data, and the impact of artificial intelligence on the management, interpretation, and sharing of vast sensor based data streams. These authors share their wealth of experience on

this critically important Research Topic and speculate on key challenges that will influence future developments.

The future of the emerging field of electroceuticals is the focus of the article “Sensing and Stimulating Electrodes for Electroceuticals” by [Liu et al.](#) Their contribution examines the potential for revolutionary developments to arise by combining real-time monitoring of human health condition with simultaneous stimulation to modulate the interface with biological systems and facilitate the delivery of therapeutic agents to precise locations. Generic tissue damage will be minimized by incorporating an ability to discriminate target tissue from normal tissue, thus reducing the impact of undesirable side-effects which all-too-often inhibit the effectiveness of therapeutic interventions. In their article, the authors examine the importance of electrode shape, electrode materials properties, number of active sites, carriers used, and methods of deployment and activation. They illustrate the potential of this area through the emergence of “sutrodes” based on platinized graphene fibers capable of recording electrophysiological signals from small autonomic nerves, which could provide a pathway to enabling the activity of individual organs to be controlled with high selectivity and precision, thereby providing new intervention strategies for improving human health.

In their contribution “Fluorescent Chemosensors for Ion and Molecule Recognition: The Next Chapter”, [Yan et al.](#) highlight the current state of the art in fluorescence based sensing, and discuss the most significant future challenges remaining in the area. They illustrate their thinking through a series of examples including an expansion in the use of tailored scaffolds that exhibit chemiluminescence in a particular molecular environment, thus offering a route to future molecular fluorescent probes with exquisite selectivity and sensitivity.

Finally, [Florea and Diamond](#) “Sensors and The Internet of Biochemical Things” consider the pathway biochemical sensing will take as the huge businesses underpinning Big Data and the Internet of Things seek new layers of highly valuable information to

integrate into our increasingly digitised world. They identify the lifetime of chemical sensors and particularly biosensors as a serious limiting challenge to expansion of the internet of things to include autonomous chemical sensors and biosensors across many application domains. They underline the importance of fundamental research in materials science as the source of solutions to current limitations of biochemical sensing technologies, and the need for closer engagement between key players along the entire technology development pathway, from fundamental research to market opportunity and societal need.

This initial Research Topic will be supplemented by articles collected under succeeding volumes in the Thought Leaders in Sensor Research Series, to further grow and develop this valuable resource for the sensor research community.

## Author contributions

DD: Writing–original draft, Writing–review and editing.

## Conflict of interest

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