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Molecular sensors and molecular electronics are a major component of a recent research area known as bionanotechnology, which merges biology with nanotechnology. This new class of biosensors and bioelectronics has been a subject of intense research over the past decade and has found application in a wide variety of fields.

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A biosensor typically consists of a bio-receptor (enzyme/antibody/cell/nucleic acid/aptamer), transducer component (semi-conducting material/nanomaterial), and electronic system which includes a signal amplifier, processor & display. Transducers and electronics can be combined, e.g., in CMOS -based microsensor systems.

Biosensor - Wikipedia

Molecular electronic sensor chips integrate single molecules as electrical sensor elements on standard semiconductor chips, making electronic biosensor devices massively scalable. While electronic biosensors have seen gradual adoption in DNA sequencing and other areas of testing, there have been no major innovations in the basic sensor technology.

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How fast and powerful can computers become? Will it be possible someday to create artificial brains that have intellectual capabilities comparable to those of human beings? The answers to these questions depend to a very great extent on a single factor: how small and dense we can make computer circuits. Very recently, scientists have achieved revolutionary advances that may very well radically change the future of computing. There are significant advantages to using biological molecules in a new computational paradigm, since nature has solved similar problems to those encountered in harnessing organic molecules to perform data manipulation. Biomolecules could be used as photonic devices in holography, as spatial light modulators, in neural network optical computing, as nonlinear optical devices, and as optical memories. Such computers may use a billion times less energy than electronic computers, while storing data in a trillionth of the space, while also being highly parallel. Research projects implemented by national and international groups have produced a large amount of data from multidisciplinary work, ranging from physics and engineering to chemistry and biology.

The dream of developing a biocomputer should not be dismissed as a sheer fantasy. Although there is naturally some doubt as to whether it is possible to design a computer using carbon-based components as in living organisms, instead of silicon-based components as in existing computers, the fact that an average brain often outperforms the most sophisticated computer in terms of the complexity of tasks, if not in terms of speed, is a living testimony to this possibility. The remaining question is to what extent a biocomputer can mimic a living organism and whether it is possible to design and fabri cate such a biocomputer within the foreseeable future. This volume does not attempt to provide immediate and exact answers to these questions but instead attempts to provide a vision and a progress report of the initial efforts. This volume is mainly a collection of papers presented at the Symposium on Molecular Electronics - Biosensors and Biocomputers, sponsored by the Divi sion of Biotechnology, Health and Environment of the Fine Particle Society, held from July 19-22, 1989 at the Society's 19th Annual Meeting in Santa Clara, California. Also included are articles contributed by those who planned to attend the conference but were unable to do so. The emergence of the field of molecular electronics is largely the consequence of one person's crusade, that of Forrest L. Carter.

How fast and powerful can computers become? Will it be possible someday to create artificial brains that have intellectual capabilities comparable to those of human beings? The answers to these questions depend to a very great extent on a single factor: how small and dense we can make computer circuits. Very recently, scientists have achieved revolutionary advances that may very well radically change the future of computing. There are significant advantages to using biological molecules in a new computational paradigm, since nature has solved similar problems to those encountered in harnessing organic molecules to perform data manipulation. Biomolecules could be used as photonic devices in holography, as spatial light modulators, in neural network optical computing, as nonlinear optical devices, and as optical memories. Such computers may use a billion times less energy than electronic computers, while storing data in a trillionth of the space, while also being highly parallel. Research projects implemented by national and international groups have produced a large amount of data from multidisciplinary work, ranging from physics and engineering to chemistry and biology.

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The latest in organic electronics-based sensing and biotechnology Develop high-performance, field-deployable organic semiconductor-based biological, chemical, and physical sensor arrays using the comprehensive information contained in this definitive volume. Organic Electronics in Sensors and Biotechnology presents state-of-the-art technology alongside real-world applications and ongoing R & D. Learn about light, temperature, and pressure monitors, integrated flexible pyroelectric sensors, sensing of organic and inorganic compounds, and design of compact photoluminescent sensors. You will also get full details on organic lasers, organic electronics in memory elements, disease and pathogen detection, and conjugated polymers for advancing cellular biology. Monitor organic and inorganic compounds with OFETs Characterize organic materials using impedance spectroscopy Work with organic LEDs, photodetectors, and photovoltaic cells Form flexible pyroelectric sensors integrated with OFETs Build PL-based chemical and biological sensing modules and arrays Design organic semiconductor lasers and memory elements Use luminescent conjugated polymers as optical biosensors Deploy polymer-based switches and ion pumps at the microfluidic level

The Green Electronics book is intended to stimulate people's thinking toward the new concepts of an environment-friendly electronics - the main challenge in the future. The book offers multiple solutions to push the classical electronic industry toward green concepts, aided by nanotechnologies, with revolutionary features that provide low power consumption in electronics, use biomaterials for integrated structures, and include environmental monitoring tools. Based on organic semiconductors/insulators without toxic precursors, green electronic technologies launched promising devices like OLED, OTFT, or nano-core-shell transistors. The Green Electronics book successfully presents the recent directions collected worldwide and leaves free space for continuing year by year with new subtopics.

There are fundamental and technological limits of conventional microfabrication and microelectronics. Scaling down conventional devices and attempts to develop novel topologies and architectures will soon be ineffective or unachievable at the device and system levels to ensure desired performance. Forward-looking experts continue to search for new paradigms to carry the field beyond the age of microelectronics, and molecular electronics is one of the most promising candidates. The Nano and Molecular Electronics Handbook surveys the current state of this exciting, emerging field and looks toward future developments and opportunities. Molecular and Nano Electronics Explained Explore the fundamentals of device physics, synthesis, and design of molecular processing platforms and molecular integrated circuits within three-dimensional topologies, organizations, and architectures as well as bottom-up fabrication utilizing quantum effects and unique phenomena. Technology in Progress Stay current with the latest results and practical solutions realized for nanoscale and molecular electronics as well as biomolecular electronics and memories. Learn design concepts, device-level modeling, simulation methods, and fabrication technologies used for today's applications and beyond. Reports from the Front Lines of Research Expert innovators discuss the results of cutting-edge research and provide informed and insightful commentary on where this new paradigm will lead. The Nano and Molecular Electronics Handbook ranks among the most complete and authoritative guides to the past, present, and future of this revolutionary area of theory and technology.