Adaptive computing's impact?

"We're coming upon a sea change in the world of semiconductors," says Nick Tredennick, former designer of the Motorola 68000 microprocessor, which powered the Apple Mac in the 1980s and early 90s. "There are compelling advantages to reconfigurable chips in terms of performance and power consumption." The momentum for adaptive computing is a result of advances in special high-speed memory chips called static ram, or S-RAM chips that make it possible to imitate the entire hardware circuits of a processor on a single chip. In adaptive computing, chip wiring would be reconfigured on the fly by software altering the circuitry's information pathways. Reconfigurable chips may offer speed, cost and energy-saving advantages, and allow for quicker product design cycles. And the ability to combine the functions of many chips into one would be particularly desirable in making smaller, lighter and more energy-efficient portable computing and communications devices. Cellphones that could work worldwide; portable computers that use suitable radio frequency and wirelessly, automatically connect to the Internet, or consumer electronics gadgets able to adjust to each new technical standard in digital sights and sounds, offer enormous attractions with upgrades as easy as downloading the latest circuit design from the Internet. The fixed-circuit approach needs templates, or masks at $1m for each new circuit, making it difficult for product designers to quickly adapt to changing markets and technology formats. But for an adaptive circuit, that investment is not unreasonable. Reconfigurable chip design has several dozen start-ups (eg QuickSilver, and GateChange Technologies), as well interesting the giants. Intel, IBM, Infineon, Motorola and Texas, have all moved into both acquisition and spin-off. Infineon acquired Morphics Technology (reconfigurable circuits for wireless digital telephone networks). Royal Philips Electronics acquired Systemonic, (reconfigurable chips for wireless data applications). Motorola invested in Morpho Technologies (reconfigurable circuits for wireless, imaging and multimedia applications). HP research laboratories has spun off two adaptive companies, Synfora (Program-In Chip-Out PICO) and Elixent (Reconfigurable Algorithm Processing RAP).

Reconfigur-able looks as if its coming to stay.

Electronic progress in materials science

Materials such as polymers, superconducting ceramics, and diamond films are likely to shape the electronics industry in the coming decade. Processing technologies for these improved materials will also gain importance.

"Advanced materials are synthesised at nano levels, creating the possibility of achieving several new structures and properties, which will enable an endless number of electronic applications," states Technical Insights analyst, Sathyaraj Radhakrishnan.

Nanostructures based on inorganic and organic semiconductors, coupled with complex materials such as polymers will form the building blocks for many future devices and systems says Radhakrishnan. "Researchers will need capital-intensive, large-scale instrumentation to characterise, synthesise, and process new materials from their smallest constituents and at all scales of assembly.

"Electronics sector advances will depend on the ability to assess life cycle costs, which include materials costs, and overcome stringent management policies and limited investment funding. Performance optimisation, miniaturisation, and integration of different classes of materials into multifunctional components are also becoming essential, as advanced electronic materials are finding a prominent place in many applications. Researchers are working on an array of new technologies including elaboration and characterisation of very thin dielectrics for gate control, enabling reliance on fewer electron memories, lithographic techniques, and optical interconnects. Many research frontiers such as synthesis of semiconducting organic materials, optical conductivity of doped conjugated polymers, holographic data storage, plastic displays, and ferro electric ceramics are also evolving.

"Multidisciplinary international collaboration is essential to make progress as challenges persist in the form of a choice of substrates, control of dopants, growth techniques to identify native defects, and quantum fluctuations," concludes Radhakrishnan.

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Organic molecule shows blue

A molecule commonly used in LED fabrication shows promise for making an organic diode laser that emits in the blue. María Díaz García and colleagues at the University of Alicante observed gain from the molecule, which is called TPD, when they pumped it with a 355 nm frequency-tripled Nd:YAG laser. TPD is used as a hole-transporting layer in LEDs, and is already widely available. The film that showed gain was made by a simple spin-coating technique, which would be far cheaper than the epitaxial deposition techniques used to make inorganic diode lasers.

Green gold

A new way to make gold form inside the cells of a micro-organism has been developed by the National Chemical Laboratory and the Armed Forces Medical College, in Pune, India.The technology could also be used in developing nanomaterials and nanoelectronics.

The research group took a micro-organism called Rhodococcus from a fig tree, and exposed it to a liquid containing gold ions. The micro-organism caused the gold ions to gain electrons, thereby forming gold nanoparticles within the micro-organism's cells. These are more concentrated and uniform in size than particles biosynthesised by previous methods using fungus.

The group will be looking into making the nanoparticles on a large scale, which could be attained by genetically modifying actinomycetes to produce more of the enzymes which cause the gold to form.