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Nanotechnology Shock Waves

By DIANE ACKERMAN

"I SING the body electric,"Walt Whitman wrote in 1855, inspired by the novelty of useful electricity, which he would live to see power streetlights and telephones, locomotives and dynamos. In "Leaves of Grass," his ecstatic epic poem of American life, he depicted himself as a live wire, a relay station for all the voices of the earth, natural or invented, human or mineral. "I have instant conductors all over me," he wrote. "They seize every object and lead it harmlessly through me... My flesh and blood playing out lightning to strike what is hardly different from myself."

Electricity equipped Whitman and other poets with a scintillation of metaphors. Like inspiration, it was a lightning flash. Like prophetic insight, it illuminated the darkness. Like sex, it tingled the flesh. Like life, it energized raw matter. Whitman didn't know that our cells really do generate electricity, that the heart's pacemaker relies on such signals and that billions of axons in the brain create their own electrical charge (equivalent to about a 60-watt bulb). A force of nature himself, he admired the range and raw power of electricity.

Deeply as he believed the vow "I sing the body electric" - a line sure to become a winning trademark - I suspect one of nanotechnology's recent breakthroughs would have stunned him. A team at the University of Exeter in England has invented the lightest, supplest, most diaphanous material ever made for conducting electricity, a dream textile named GraphExeter, which could revolutionize electronics by making it fashionable to wear your computer, cellphone and MP3 player. Only one atom thick, it's an ideal fabric for street clothes and couture lines alike. You could start your laptop by plugging it into your jeans, recharge your cellphone by plugging it into your T-shirt. Then, not only would your cells sizzle with electricity, but even your clothing would chime in.

I don't know if a fully electric suit would upset flight electronics, pacemakers, airport security monitors or the brain's cellular dispatches. If you wore an electric coat in a lightning storm, would the hairs on the back of your neck stand up? Would you be more likely to fall prey to a lightning strike? How long will it be before a jokester plays the sound of one-hand-clapping from a mitten? How long before late-night hosts riff about electric undies? Will people tethered to recharging poles haunt the airport waiting rooms? Will it become hip to wear flashing neon ads, quotes and designs - maybe a name in a luminous tattoo?

Another recent marvel of nanotechnology promises to alter daily life, too, but this one, despite its silver lining, strikes me as wickedly dangerous, though probably inevitable. As a result, it's bound to inspire labyrinthine laws and a welter of patents and to ignite bioethical debates.

Nano-engineers have developed a way to coat both hard surfaces (like hospital bed rails, doorknobs and furniture) and also soft surfaces (sheets, gowns and curtains) with microscopic nanoparticles of silver, an element known to kill microbes. You'd think the new nano-coating would offer a silver bullet, be a godsend to patients stricken with hospital-acquired sepsis and pneumonia, and to doctors fighting what has become a nightmare of antibiotic-resistant micro-organisms that can kill tens of thousands of people a year.

It does, and it is. That's the problem. It's too effective. Most micro-organisms are harmless, many are beneficial, but some are absolutely essential for the environment and human life. Bacteria were the first life forms on the planet, and we owe them everything. Our biochemistry is interwoven with theirs. Swarms of bacteria blanket us on the outside, other swarms colonize our insides. Kill all the gut bacteria, essential for breaking down large molecules, and digestion slows.

Friendly bacteria aid the immune system. They release biotin, folic acid and vitamin K; help eliminate heavy metals from the body; calm inflammation; and prevent cancers. During childbirth, a baby picks up beneficial bacteria in the birth canal. Nitrogen-fixing bacteria ensure healthy plants and ecosystems. We use bacteria to decontaminate sewage and also to create protein-rich foods like kefir and yogurt.

How tempting for nanotechnology companies, capitalizing on our fears and fetishes, to engineer superbly effective nanosilver microbe-killers, deodorants and sanitizers of all sorts for home and industry.

THAT'S why Kathleen Eggleson, a scientist at the University of Notre Dame, founded the Nano Impacts Intellectual Community, a monthly meeting that draws campus researchers, community leaders and visiting scholars and authors to discuss the ethics and impact of new developments in nanotechnology. In a recent paper out of the Center for Nano Science and Technology, she highlights the risk of unregulated products destroying microbial biodiversity.

"Just this last December," she points out, a pesticide coating for textiles "was the first nano-scale material approved as a pesticide by the E.P.A." Whether it's electric tuxedos for the prom or hospital chairs robed in pesticide jackets, the writing is on the wall (though you'll need a microscope to read it).

And when it comes to the delicate balance of earth's life forms, it may be a small, small world after all.

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