PATTERN LANGUAGE: CLOTHING AS COMMUNICATOR
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On Suits and Circuits

The shirt on your back provides a lot more than a means to keep dry and warm. The colors, patterns and styles of clothing may convey ideologies, professions and even financial circumstances. As such, clothing represents one's most personal and important possession. The materials and manufacturing processes have remained conceptually the same, however, for hundreds of years, even though clothing is as old as the human race itself. In conventional systems, fibers or sheets of basic materials – plant/animal products, synthetic polymers, etc. – are woven or pressed together to create a passive, non-interactive fabric.

This long-standing situation may change dramatically, due to advances in materials and fabrication techniques that are beginning to emerge from research laboratories around the world. In particular, scientists and engineers have discovered electronic materials that are thin and lightweight, with mechanical characteristics that allow them to be bent and even stretched. Some of these materials are based on unusual substances such as electronic plastics or carbon nanotubes. Others are conventional electronic materials that have been structured into unusual shapes, such as ultrathin 'wavy' silicon ribbons that respond to mechanical strains like an accordion bellows. New fabrication techniques can form active circuits using these materials, over sufficiently large areas and at sufficiently low cost that one can begin to conceive of using them to manufacture 'active' textiles, sometimes referred to as 'electrotextiles'. These systems integrate active electronics into a garment, without changing its essential mechanical 'feel' or 'wearability'. As a result, a comfortable pair of jeans could include sophisticated silicon electronic systems and still feel like a comfortable pair of jeans, and not a suit of armor made out of silicon chips. The implications are enormous.

Imagine your clothing as an active, virtual skin that can extract power from sunlight through solar cells; provide real-time health monitoring; sense information about the environment; display or communicate information to others. Other apparel – gloves, hats, shoes – could be produced with similar functionality. Some basic systems are already becoming available: thin, flexible solar cells on jackets; light sources and optical fibers woven into fabrics; and shoes that contain mechanical actuators. Many of these devices will find initial applications in specialized areas of medicine (e.g. smart surgical gloves) and defense (e.g. battle fatigues with chem/bio sensors).

The ultimate promise of 'electrotextiles' for widespread consumer use will be realized through additional innovations, many of which will be created through collaborations between unlikely partners: materials scientists and fashion designers; mechanical engineers and textile manufacturers; electrical engineers and seamstresses. Successful efforts will lead to a future in which 'suiting up' will also mean 'booting up."

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