

Goldfield

Bioinspired Devices

Emulating Nature's Assembly and Repair Process

Robotic exoskeletons that allow stroke survivors to regain use of their limbs, 3D-printed replacement body parts, and dozens of other innovations still in schematic design are revolutionizing the treatment of debilitating injuries and nervous system disorders. What all these technologies have in common is that they are modeled after engineering strategies found in nature—strategies developed by a vast array of organisms over eons of evolutionary trial and error. Eugene Goldfield lays out many principles of engineering found in the natural world, with a focus on how evolutionary and developmental adaptations, such as sensory organs and spinal cords, function within complex organisms. He shows how the component parts of highly coordinated structures organize themselves into autonomous functional systems. For example, when people walk, spinal cord neurons generate coordinated signals that continuously reorganize patterns of muscle activations during the gait cycle. This self-organizing capacity is just one of many qualities that allow biological systems to be robust, adaptive, anticipatory, and self-repairing. To exploit the full potential of technologies designed to interact seamlessly with human bodies, properties like these must be better understood and harnessed at every level, from molecules to cells to organ systems. *Bioinspired Devices* brings together insights from a wide range of fields. A member of the Wyss Institute for Biologically Inspired Engineering, Goldfield offers an insider's view of cutting-edge research, and envisions a future in which synthetic and biological devices share energy sources and control, blurring the boundary between nature and medicine.

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