Orthopaedics – More than the bent child. A technology driven specialty.

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Structural defects and deformities in humans are common. They arise from a variety of common causes including trauma, surgery, developmental defects or infection. The specialty of orthopaedics arose from the desire to correct spinal deformities in childhood. With the evolution of the art and science of orthopaedics, the craft now spans the continuum from machines to molecules. The use of biologic, prosthetic and composite materials to afford the correction of defects and alignment has progressed such that complex reconstructions are now commonplace.

Reducing patient morbidity from the use of autologous or allograft tissue has placed the focus on prostheses. Advances in manufacturing and materials have now opened new strategies for reconstructing musculoskeletal defects. Patient specific implants are now the goal of 21st century orthopaedics.

Convergence of synthetic and biologic sciences has resulted in techniques that combine additive manufacturing and stem cell science to allow a new way of customizing implants. These pave the way for exploiting structural design features to improve strength, aid tissue attachment and conform to the part being replaced with the ability to re-engineer specialized tissue from stem cell therapy. The challenges of future orthopaedics will address the fixation of prostheses, the union of bones, the repair of soft tissue defects and the attachment of tendons. Reestablishing neural continuity and building connections between nerves and synthetic materials will be a dream brought closer to reality through advances in technology. Just in time manufacturing and surgeon-driven sculpting of musculoskeletal tissue will focus the science of biofabrication and cell biology with a greater emphasis on translation.