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Autore	Kretzer J. Philippe
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Sommario/riassunto	<p>Joint replacement is a very successful medical treatment. However, the survivorship of hip, knee, shoulder, and other implants is limited. The degradation of materials and the immune response against degradation products or an altered tissue loading condition as well as infections remain key factors of their failure. Current research in biomechanics and biomaterials is trying to overcome these existing limitations. This includes new implant designs and materials, bearings concepts and tribology, kinematical concepts, surgical techniques, and anti-inflammatory and infection prevention strategies. A careful evaluation of new materials and concepts is required in order to fully assess the strengths and weaknesses and to improve the quality and outcomes of joint replacements. Therefore, extensive research and clinical trials are essential. The main aspects that are addressed in this Special Issue are related to new material, design and manufacturing considerations of implants, implant wear and its potential clinical consequence, implant fixation, infection-related material aspects, and taper-related research topics. This Special Issue gives an overview of the ongoing research in those fields. The contributions were solicited from researchers working in the fields of biomechanics, biomaterials, and bio- and tissue-engineering.</p>