Tissue remodeling occurs in disease and following trauma, often yielding results that are dysfunctional and which may ultimately progress towards tissue failure. In the case of mechanically active soft tissues, the mechanical environment in which the damaged tissue heals impacts the direction and outcome of the remodeling process. To develop biomaterial-based approaches to improve soft tissue repair we have created degradable supports that act as scaffolds for new tissue generation or as temporary load bearing elements during the remodeling process. Efforts have been directed at: 1) the adverse ventricular remodeling process that occurs following myocardial infarction resulting in dilated ischemic cardiomyopathy, 2) the remodeling of veins used in arterial grafting and tissue engineered blood vessel development, and 3) scaffolds used to reconstruct the abdominal wall. Two general types of supporting biomaterials have been developed and tested in at least one of these settings. In the first approach thermoplastic elastomers, typified by poly(ester urethane)urea, have been synthesized and processed to form microporous elastic patches or wraps. Molecular design parameters can be selected to tune mechanical and degradation properties. In the processing steps, composites with natural materials, such as extracellular matrix digests and components, have been generated. A second approach has focused on the development of thermoresponsive, injectable copolymers that “set up” quickly in situ to provide mechanical support to tissues under load, but then degrade to become soluble over time. The application of these materials in vivo has been shown to alter remodeling patterns and to facilitate tissue generation with associated functional improvements.