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Investigations on the Feedback Loop that controls Bone Remodeling MARKUS A. HARTMANN, RICHARD WEINKAMER, PETER FRATZL, MPI-KGF/Dept. Biomaterials, D-14476 Potsdam, YVES BRECHET, ENSEEG/LTPCM, F-38402 Domaine Universitaire de St. Martin d'Heres, Cedex — Bone is a living tissue that can adapt its shape and inner architecture to withstand mechanical loading experienced in daily life. The bone tissue is continuously renewed in a process called bone remodeling involving specialized cells: osteoblasts deposit bone, osteoclasts remove bone. The process is regulated by a feedback loop, where the probability for bone deposition (resorption) is related to a local mechanical stimulus. Our interest is the effect of different relations (i.e., different remodel laws) on the resulting bone mass and geometry. We developed a computer model [1], where the spongy architecture of trabecular bone is mapped onto a lattice and the local mechanical loading is calculated using a simple algorithm. Depending on the remodel law, the simulations show remarkable differences in the heterogeneity of the bone architecture and the reaction to perturbations (e.g., changes in the osteoclastic activity). Comparison of these results to data obtained from real bone gives further insight in the underlying feedback loop.
[1] Weinkamer et al., PRL **93**, 228102 (2004)

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