Mini-symposium ICONSOM 2022:

MS- Trabecular bone remodeling vs shape and topology optimization principles
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Some information about the topic of MS:

Wolff's law is not indeed a mechanical law but rather a hypothesis, that the trabecular bone is a self optimizing material. Also others researchers suggested, that the trabecular tissue is able to adapt its structural form in reaction to the external load. In this sense, it is a problem similar to the structural optimization, especially the topology optimization. The mini-symposium aims to discuss the approach of using the bio-mechanical models of the trabecular bone remodeling phenomenon directly as a base for the structural optimization. The similarity between the phenomenon of trabecular bone remodeling and topology optimization has been recognized and it is used in two opposite research approaches. The first approach is to use exact mathematical results from the optimization area to predict the evolution of the bone structure. The optimization methods are used to recreate the real biological structural forms of bone. The second approach, the opposite direction, is to apply the bio-mechanical observations and models to the structural optimization issues. These studies show that the remodeling of the trabecular bone can be treated as a simultaneous optimization of shape and topology and are the base for biomimetic structural optimization approaches. The domain independence, functional configurations during the process of optimization and possibility to solve multiple load problems are the unique features of these biomimetic methods. The mini-symposium will open the opportunity for discussion of the different aspects and role of strain energy density on the structural surface both as a bone remodeling signal and the condition in the stiffest design theorem.

Any research on trabecular remodeling or structural optimization will be appreciated and will certainly contribute to interesting discussions during the mini-symposium.