

## Climate Adaptive Building Shells for Plus-Energy-Buildings, Designed on Bionic Principles

**Authors :** Andreas Hammer

**Abstract :** Six peculiar architecture designs from the Frankfurt University will be discussed within this paper and their future potential of the adaptable and solar thin-film sheets implemented facades will be shown acting and reacting on climate/solar changes of their specific sites. The different aspects, as well as limitations with regard to technical and functional restrictions, will be named. The design process for a “multi-purpose building”, a “high-rise building refurbishment” and a “biker’s lodge” on the river Rheine valley, has been critically outlined and developed step by step from an international studentship towards an overall energy strategy, that firstly had to push the design to a plus-energy building and secondly had to incorporate bionic aspects into the building skins design. Both main parameters needed to be reviewed and refined during the whole design process. Various basic bionic approaches have been given [e.g. solar ivy<sup>TM</sup>, flectofin<sup>TM</sup> or hygroskin<sup>TM</sup>, which were to experiment with, regarding the use of bendable photovoltaic thin film elements being parts of a hybrid, kinetic façade system.

**Keywords :** bionic and bioclimatic design, climate adaptive building shells [CABS], energy-strategy, harvesting façade, high-efficiency building skin, photovoltaic in building skins, plus-energy-buildings, solar gain, sustainable building concept

**Conference Title :** ICSAUD 2016 : International Conference on Sustainable Architecture and Urban Design

**Conference Location :** Istanbul, Türkiye

**Conference Dates :** February 15-16, 2016