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Design in Nature: Learning from Trees

Claus Mattheck

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The chicken bone you nibbled yesterday and threw away was a high-tech product! Not only that: it was a superlative light-weight design, functionally adapted to its mechanical requirements. No engineer in the world has, as yet, been able to copy this structural member, which is excellently optimized in its external shape and its internal architecture as regards minimum weight and maximum strength. The tree stem on which you recently carved your initials has also, by life-long care for its body, steadily improved its internal and external structure and adapted optimally to new loads. In the course of its biomechanical self-optimization it will heal up the notch you cut as speedily as possible, in order to repair even the smallest weak point, which might otherwise cost it its life in the next storm. This book is dedicated to the understanding of this biomechanical optimization of shape. It is the synthesis of many years of extensive research using the latest computer methods at the Karlsruhe Research Centre to help understand the mechanism of biological self-optimization (adaptive growth) and to simulate it by computer. The method newly developed for this purpose was called CAO (Computer-Aided Optimization). With this method, it is possible to predict the growth of trees, bones and other biological structures from the tiger's claw to the sea urchin's skeleton.

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