Fayoum University

Faculty of Engineering

Architecture department

Designing Bio-inspired Adaptive Climatic Facades and Its Effect on Daylight Performance of Building

By:

Eng. A'laa Salah Mohammed Ahmed

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science

Under Supervision of

Prof. Dr. Ehab Mahmoud Bayoumi Okba

Professor of Architecture and Environmental Design

Faculty of Engineering, Fayoum University

Dr. Eman Badawy Ahmed Mahmoud

Lecturer at Architecture Department

Faculty of Engineering, Fayoum University

2018

Abstract

The Earth has witnessed a climate change and the global warming phenomenon, which leads to high temperature and increased natural disasters. This leads to many economic, environmental and social problems, affecting people, community resources and development activities. The facade of the building is responsible for energy and information exchange with the environment. It separates the internal environment and the external environment surrounding the building. The facades provide protection from external factors, climatic factors, natural light control, and improved energy performance in buildings.

Nature-based approaches can provide sustainable solutions to meet the challenges of climate change mitigation and adaptation in order to conserve the ecosystems necessary for life. Nature is the source of inspiration for providing biological solutions for adaptation. Biology is no longer a research trend for biologists, but a new inspiration for technological thinking. Systems in nature provide a large database of strategies and mechanisms that can be achieved in the design of buildings inspired by nature.As a result of similarities between the building and living organisms, adaptation methodsin nature can be applied to buildings' facades that they can adapt to surrounding environmental changes.

The facades play a major role in daylight control, which is a major energy source, and the facades are the only source of strength of the ecosystem. In addition to its importance in determining the personality of the building and users. Not only does it replace industrial light during the day, it also helps to reduce energy use in lighting, as it affects both heating and cooling loads, thus it is an indicator of efficient energy design. In addition, daylight provides comfort. These factors reflect the efficient daylight performance of the buildings.