

MECHATRONICS BOOK SERIES SYSTEM DESIGN AND SIGNAL PROCESSING VOLUME 1

Editors

**Asan G. A. Muthalif
Amir Akramin Shafie
Siti Fauziah Toha
Iskandar Al-Thani Mahmood**



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CHAPTER 30

Leveraging on Nature for Systems Design

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30.1 Introduction

“Behold! In the creation of the heavens and the earth, and the alternation of night and day, – there are indeed Signs for men of understanding.” (Qur’an, 3:190) [1].

“Men who celebrate the praises of God, standing, sitting, and lying down on their sides, and contemplate the (wonders of) creation in the heavens and the earth (with the thought): “Our Lord! not for naught hast Thou created (all) this! Glory to Thee! Give us salvation from the penalty of the Fire.” (Qur’an, 3:191) [1].

The meaning of the two verses from the Holy Qur’an above clearly stated that there are so much to learn from observing His creations, the world around us. The creations are for us to contemplate, and they are there to serve some purposes, and those purposes are for us to seek to discover. As we look around and learn from them we would know The Creator better and understand the creations while in the process increasing our iman. Through that understanding we would be able to mimic or emulate that creation either directly or on its principles to design and produce something new.

Indeed, humankind has been taught and learnt from nature. The story of Qabil being taught the method of handling his deceased brother is a clear example.

“Then Allah sent a raven, who scratched the ground, to show him how to hide the shame of his brother. “Woe is me!” said he, “was I not even able to be as this raven, and to hide the shame of my brother?” then he became full of regrets.” (Qur’an, 5:31) [1].

Men have been learning from the environment and making use of the resources to their benefits. Many of the things that we need can be found or made from resources available around us. They may not be in the form useful for our purposes, but through a series of design efforts, they can be assembled to produce useful tools and equipments.

For the purpose of this paper, the author uses ‘nature’ as a generic word to represent the creations. There are two main methods by which we can leverage nature to design and produce products that better serve our needs. They are by:

- (1) exploiting what nature has provided in the form of natural laws, and
- (2) copying the way nature accomplishes things.

The latter is generally known as biomimicry [2].

Many new products were inspired by the way nature goes about its business. Velcro tapes, bullet trains, and radar invisible planes are just some examples. This paper reviews the two ways in