

## INTRODUCTION

Throughout history, many leading thinkers have been inspired by the parallels between nature and human design, in mathematics, engineering and other areas. The great Italian engineer and artist Leonardo da Vinci wrote [1]:

*'Although human genius through various inventions makes instruments corresponding to the same ends, it will never discover an invention more beautiful, nor more ready nor more economical than does nature, because in her inventions nothing is lacking, and nothing is superfluous.'*

Modern research has confirmed that nature contains countless elegant and highly optimised systems that are of great relevance to human design.

One important reason for studying nature is that nature shows what is possible at the extremes of performance. For example, until recently engineers could not understand how flying insects like bees could hover and fly based on conventional understanding of aerodynamic laws. Recent studies have revealed a range of unusual aerodynamic effects that produce the required lift. These studies have inspired the development of micro air vehicles around the world. Such developments would probably never have happened if insects had not demonstrated their feasibility.

An impressive feature found in nature is how different (human-specified) disciplines are so deeply integrated together. Human skin looks simple from a distance but it integrates a great array of sensors, cells, hairs, nerves and blood vessels. Nature provides human designers with important examples of how to fully integrate different disciplines together.

Another reason for studying nature is that nature provides wonderfully elegant solutions. Trees are efficient structures and yet contain elegant colours and shapes. Bird feathers are also impressive structures and yet they contain fine colours and patterns. Many modern car shapes have been inspired by animal forms and the result has often been successful in terms of performance and popularity. With today's environmental problems there is an urgent need to learn sound environmental principles from nature. Studying the eco-cycles in nature can provide important lessons for engineers and scientists.

The huge increase in biological knowledge, developments in engineering systems, together with the virtual revolution in computer power and simulation modelling, have all made possible more comprehensive studies of nature. Scientists and engineers now have at their disposal a vast array of knowledge and data for materials, mechanisms and systems. The study of design in nature is therefore an important field of research with many rich avenues of study. It has also given a greater understanding of biology in nature.

This new journal will cover all aspects of Design and Nature and we hope you will contribute to its success by considering it an outlet for your research.



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[1] **Da Vinci, L.**, Manuscript RL 19115v; K/P 114r located in the Royal Library, Windsor Castle, Windsor, England, ca. 1500.