

## An Analysis of Uncoupled Designs in Chicken Egg

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**Abstract :** Nature has perfected her designs over 3.5 billion years of evolution. Research fields such as biomimicry, biomimetics, bionics, bio-inspired computing, and nature-inspired designs have explored nature-made artifacts and systems to understand nature's mechanisms and intelligence. Learning from nature, the researchers have generated sustainable designs and innovation in a variety of fields such as energy, architecture, agriculture, transportation, communication, and medicine. Axiomatic design offers a method to judge if a design is good. This paper analyzes design aspects of one of the nature's amazing object: chicken egg. The functional requirements (FRs) of components of the object are tabulated and mapped on to nature-chosen design parameters (DPs). The 'independence axiom' of the axiomatic design methodology is applied to analyze couplings and to evaluate if egg's design is good (i.e., uncoupled design) or bad (i.e., coupled design). The analysis revealed that egg's design is a good design, i.e., uncoupled design. This approach can be applied to any nature's artifacts to judge whether their design is a good or a bad. This methodology is valuable for biomimicry studies. This approach can also be a very useful teaching design consideration of biology and bio-inspired innovation.

**Keywords :** uncoupled design, axiomatic design, nature design, design evaluation

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