


| Phase     | Step  | Key Points  |
|-----------|---|---|
| Identify  | Develop a statement of need                           | Frame the need in the most basic concepts and terms possible. Strip away your pre-conceptions as to how a function should be achieved. Begin your search for possible solutions from the broadest base possible to maximize the possibility of finding truly "aha!" adaptations.  |
| Translate | Biologize the question                                | Identify functions that nature might devise to meet the need defined above. Remember the vase/face optical illusion: just as the "negative" space between the two faces actually presents useful information (the vase), the fact that no organisms have chosen to evolve in a certain way provides valuable information about that design.  |
| Discover  | Find the best natural models                          | Logically speaking, the organism whose very <i>survival</i> depends on the function you are trying to accomplish probably has optimized its adaptation most effectively in nature. Look for champion adapters in extreme environments at both ends of whatever continuum you are studying – e.g., desert/rainforest, tropical/tundra, high/low altitude, scorching/freezing.  |
| Evaluate  | Play – then design                                    | Nature's solutions are local optima, not universal optima. As such, consider carefully the habitat criteria you identified in "biologize the question" such as climate, nutrient, social and temporal conditions. These constraints will likely also apply to your design proposal. In addition, don't shy away from chimera solutions that borrow from multiple types of organisms.  |
|           | Dig deeper  | Mimicking the form is not enough, though it is simplest to achieve. True sustainability requires the mimicking of process and ecosystem as well. Nature took 3.5 billion years; expect biomimetic product and process design to require much patience and long-term commitment.   |
|           | Double-check your results against "Life's Principles" | We need to wean ourselves from top-down, punch out manufacturing processes. We also need to standardize our basic building blocks to enable wide-scale, cross-functional recycling and bottom-up manufacturing.   |

## METHOD 1:

## DESIGN CHALLENGE STRATEGY in DETAIL