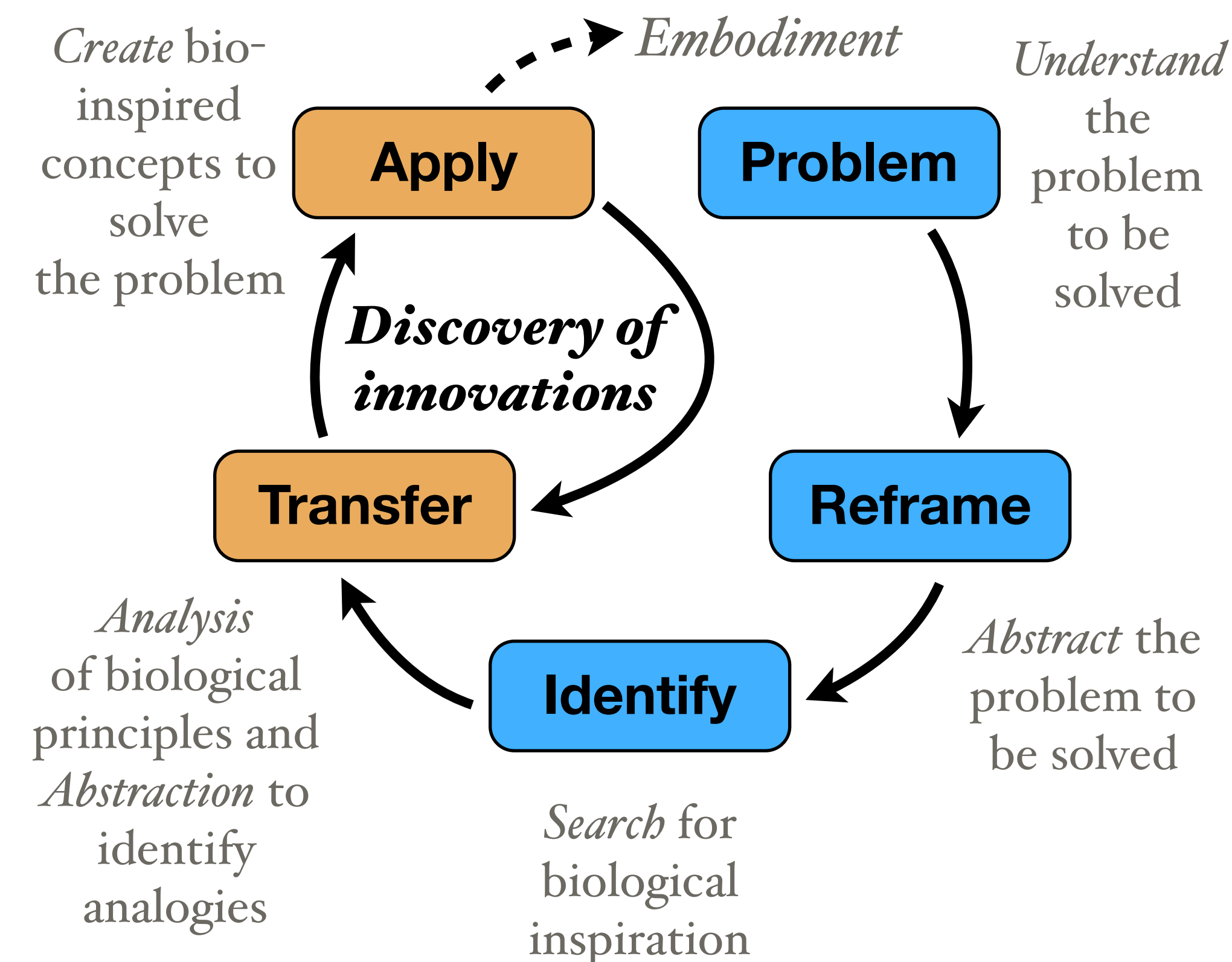# Visually Guiding the Mindset of Bio-inspired Design

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The Challenge

The discovery of biomimetic innovations requires iterative knowledge building, connection making and idea generation. Designers can get discouraged and wonder "I'm I doing this right?".

Process Challenge: Getting lost in the process of bio-inspired design.

The Innovation

Overcome the challenge: Use a visual guide based in the concept-knowledge theory of design to structure the critical thought processes of bio-inspired design, or map the mindset.

The visual guide below, called a C-K map[1,2], can improve connections between biology and engineering for problem solving. Solutions are informed by knowledge.

Dr. Nagel, Dr. Pitaparti, Dr. Rose, Dr. Beverly © 2019
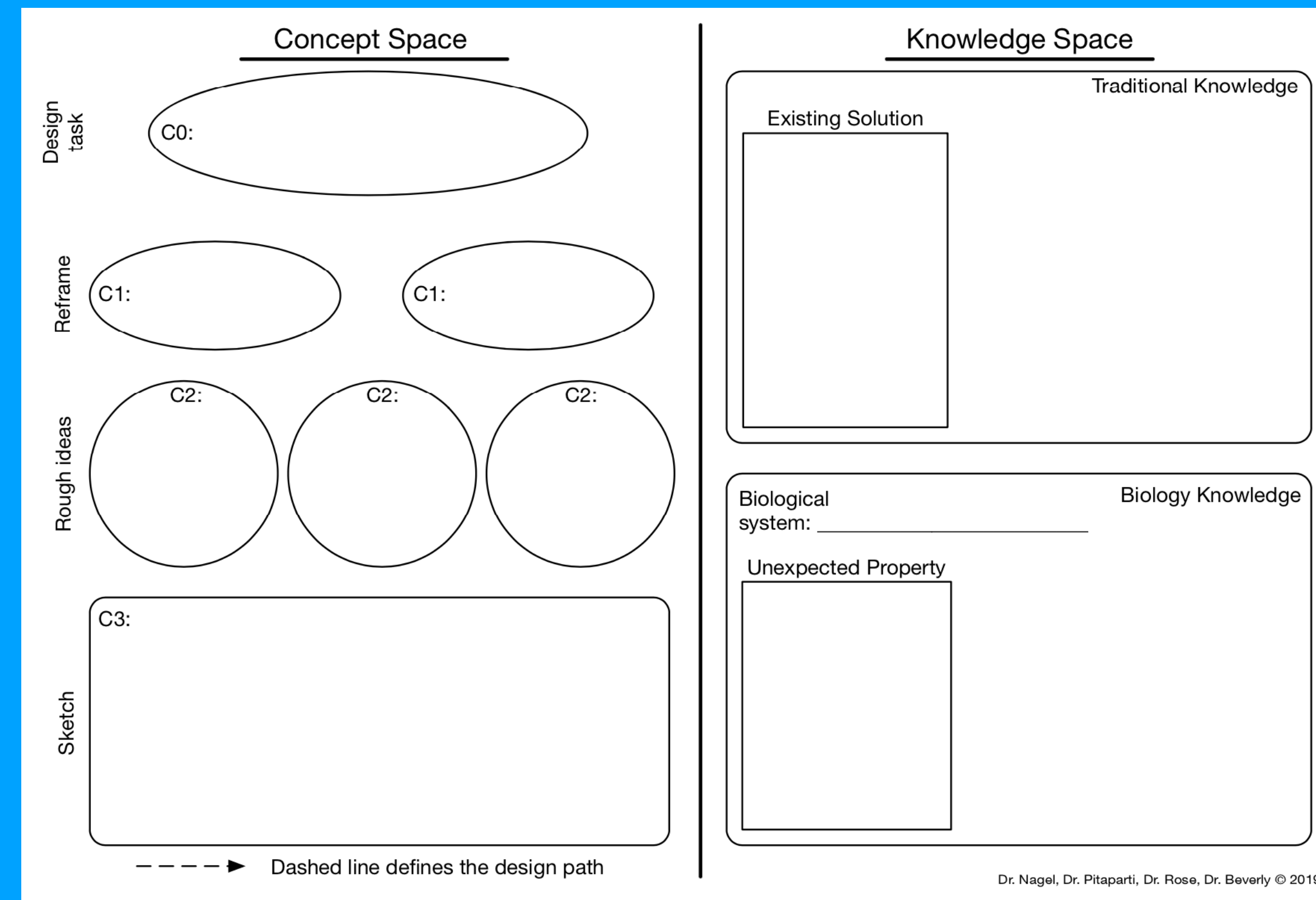
The Theory

Properties of concept-knowledge theory[3]:
* Comprised of two spaces: knowledge (K) space contains propositions that are known, and the concept (C) space contains propositions that are undetermined
* Facilitates innovation through building and testing connections between the K and C spaces
* Adaptive and generalizable across scientific domains and engineering problems

[1] Nagel, JKS, Pittman, P, Pidaparti, R, Rose, C, Beverly, CL (2016) "Teaching Bio-inspired Design Using C-K Theory," Bioinspired, Biomimetic and Nanobiomaterials, Vol. 6(2), pp.77-86.
[2] Nagel, JKS, Pittman, P, Knaster, W, Tafoya, E, Pidaparti, R, Rose, C (2019) "Preliminary findings from a comparative study of two bio-inspired design methods in a second-year engineering curriculum." Proceedings of the 2019 ASEE Annual Conference and Expo, Tampa, FL.
[3] Hatchuel A, Salgueiredo CF (2016) Beyond analogy: A model of bioinspiration for creative design. Artificial Intelligence for Engineering Design, Analysis and Manufacturing 30:159 - 170. doi:10.1017/S0890060416000044