

Nature-Inspired Chemical Engineering Applied to Particle Technology – A pedagogical approach to innovation in particle technology

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Rather than *ad hoc* biomimicry, the Nature-Inspired Chemical Engineering (NICE) methodology seeks to understand the fundamental mechanisms underpinning desired properties, like efficiency, scalability or robustness, in natural systems, in order to apply them in solving chemical engineering problems. It does so, being cognizant of the context of engineering applications that is typically different from the natural world. What can be learnt from the way patterns form on dunes to inform the fundamentals of fluidization or guide better driers of pharmaceutical powders? What does the structure of leaves and lungs teach us about ways to facilitate flow and diffusion in problems of interest to the design of porous materials for catalysis or biomedical applications?

By being grounded in fundamentals, the NICE approach is systematic and of broad applicability, making it useful as a methodology for engineers to learn and practice, when seeking innovative solutions to practical problems. Complementing a plenary presentation at the WCPT on the same subject, we discuss the NICE methodology and the development of a NICE course for senior undergraduate and postgraduate engineering students, as well as outreach projects that attract students (including from underrepresented groups) in an engaging way to science and engineering. Student team-led projects demonstrate the variety of particle technology problems that can be tackled by the NICE approach. Thus, the NICE methodology acts as an attractive framework to provide out-of-the-box solutions to challenging problems in particle technology and beyond.