

## **Soft Robotics: Industrial Perspective**

Yigit Menguc, Facebook Reality Labs/Oregon State University

Our coordination and convergence challenges in industrial soft robotics are defined by task uniqueness (no one has ever tried to do what we do) and expansive multidisciplinary (...→chemistry→materials→mechanics→design→...). Such an environment makes it hard to scope and align research for the individual scientists, engineers, and designers, and makes prioritizing the work ambiguous for the academic and industrial organization.

The history of scientific discovery highlights certain research teams (Bell Labs, PARC, Rad Lab) that implemented strategic organizational and tactical behavioral innovations that lead to a culture of convergence. All research may be considered on a two dimensional space defined by the axes of Fundamental↔Applied and Curiosity-Driven↔Use-Inspired. Industrial soft roboticists are working in the quadrant of Fundamental, Use-Inspired research — called Pasteur's Quadrant — that is neither pure basic nor pure applied research.

Much like academia, industrial research into soft robotics is based on the fundamental questions that push each subsystem forward. The anatomy of soft robots spans actuators, sensors, control, power, and the mechanical structural (skin, bone, etc). The divergence between academia and industry is in terms of value assigned to system integration and to reliability/replicability. System integration is often considered technical and without intellectual merit, yet the gaps in human knowledge around holistic system design is vast -- especially in soft robotics. Risk assessment, balancing, and mitigation drive much of the industrial research portfolio management -- and a major attribute of this process is assessing the reliability and replicability of novel technology. The current academic incentive for novelty and first-to-press discounts the value of replicability/reliability that drives industrial research. Strengthening the alignment and bridging the divergence between academy-industry must be our goal in soft robotics research if it is to broadly translate its impact to society.