

Establish a Manufacturing Science Laboratory

Background: Society's reliance on technological advances to satisfy emerging needs is predicated on new advances in discovery science that can be developed and deployed to the marketplace. Further, the pandemic may change manufacturing in multiple, as yet unknown ways (e.g., more remote operations, shifts to different products, etc.), and the needs for quick technology development and deployment will be more acute. Scientific and technological discoveries are transferred to the market place at a pace that lags behind the change in societal needs.

Translating new scientific discoveries, made at the laboratory bench, to commercialized technological solutions requires 2 core capabilities: 1) scale up the production of new chemicals, biological compounds, and/or materials, and 2) effective integration into engineered devices.

With current approaches, these translation processes span decades. For example, in the case of lithium-ion batteries, the manufacturing developments took 20 years to translate the initial discovery to a commercial application. The urgency of emerging needs makes this time lag unsupportable; we cannot afford to wait decades to realize new technology solutions. To meet society's needs to protect health, environment and economic stability, a new science-based paradigm is needed to accelerate the translation of enabling discovery science to impactful market realization.

Proposal: The formation of a stand-alone Manufacturing Science Laboratory will provide a transformational capability to the U.S. research enterprise to dramatically shorten the time from scientific discovery to consumer-ready technology. The creation of a specialized Manufacturing Science Laboratory will enable this new accelerated approach to manufacturing science. With the mandate to provide new advanced tools and capabilities to dramatically decrease the time from scientific discovery to deployed technology, this Laboratory can collaborate with and help enable more technologies to emerge from all federally funded research and development centers as well as help enable university-lab based research to emerge. As a result, the US will more rapidly reap the return on research investment through its societal impact, enhanced national competitiveness and security. This new Laboratory represents both an investment in core infrastructure that is missing in the U.S. research landscape and a sustained research program to answer new demands for rapid translation of discovery science.

Proposed Funding: The Manufacturing Science Laboratory is envisioned as an NSF or joint NSF/NIST program, requiring an initial infrastructure investment (estimated \$200 million) and a yearly R&D budget (estimated \$50-\$80 million).

