NIST Laboratory Staff Partnerships via NNMI

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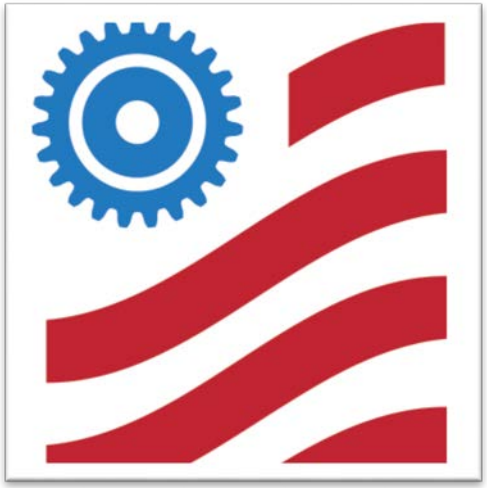

NIST Laboratory Staff and National Network for Manufacturing Innovation

Original mission/purpose

Original model is based on traditional NIST efforts to engage with industry and other agencies in their measurement science needs.

- Through workshops, conferences, and meetings, NIST staff identify and leverage existing and emerging resources to address current and anticipated needs.

None of the NNMIs are NIST led

- The interactions mimic traditional interactions as PIs, Groups, Divisions, Labs engage with industry and academia.
- NIST staff are drawn to the metrology challenge – independent of NNMI sponsor.

NIST Labs Lead: Kevin Jurrens, EL

- $5M Measurement Science Grant
- Serve on Technical Advisory Board
- Serve on Advisory Groups and SubGroups
  - Additive Manufacturing Road Map (EL)
  - Process/Material/Property Data Schema (EL)
  - Material Properties & Measurements (EL, MML)

America Makes
National Additive Manufacturing Innovation Institute

Technical Collaborations:

- NIST researchers collaborate with America Makes in several areas, including **in-situ process monitoring, non-destructive evaluation, and layer-wise quality certification**.
- A **NIST workshop on measurement science for additive manufacturing** documented industry needs and priorities to use as a starting point for the **National Additive Manufacturing Roadmap** and the first America Makes set of projects.
- America Makes engaged NIST for development of a **standards strategy to carry forward the technical results from America Makes** funded projects **into ASTM F42 and ISO/TC 261 standards** to ensure dissemination and transition of results to U.S. industry.

NIST Lead: Simon Frechette, EL

- Seat on DMDII Executive Committee
- Seats on DMDII Technical Advisory Committee
- Seats on DMDII Working Groups:
  - Standards for Digital Manufacturing Working Group
  - Shop Floor Demonstration Facility Working Group

Technical Collaborations:

- NIST researchers participate in DMDII technical projects.
- NIST contributes to digital manufacturing standards to ensure dissemination and transition of results from DMDII funded projects to U.S. industry.
- NIST is providing reference data for ASME and ISO manufacturing integration standards that are considered key by DMDII members.
- DMDII engaged NIST's Intelligent Systems Division (EL) to define and address the DMDII focus area on Intelligent Machines.

NIST Labs Lead:

Timothy Foecke, MML

- ONR Government Oversight Panel for ONR
- ONR review panel that selected LIFT.
- Institute Proposal Review team
- LIFT Project Ideation panel

Technical Collaborations:

- NIST will provide advanced metrology in the form of:
  - **mechanical characterization** (high rate and multiaxial) and
  - **microstructural measurements** (texture, crystallography, and phases)
  - **expertise in measuring stresses** (NCNR and DIC strain measurement)
- **NIST Center for Automotive Lightweighting** (NCAL) research team is slated to **participate in** at least one of the **Round Two** projects being considered
  - NIST will provide complex mechanical characterization (ex. **high rate testing** of a **new welding technology**) and perhaps measure **stresses** around the joint.
- NCAL provides research team participants and SMEs as appropriate for LIFT. A **CRADA** is being drafted by TARDEC. No funds will come to NIST.

NIST Labs Lead:

Jeffrey Gilman, MML

Seat on DOE/IACMI Governmental Panel

Technical Collaborations:

- DOE and IACMI leadership recently visited NIST to tour composites research labs and to plan collaboration between IACMI and NIST. Three NIST projects were discussed:
  - **Advanced fiber measurements** (MML)
  - **NIST Center for Automotive Lightweighting** (MML)
  - **Advanced Composites project** (MML)

  This project includes partnerships with CNST for their expertise in **nanomanufacturing**, EL for their expertise in **service life**, and PML for their expertise in **measurements**.
- Tools being developed by NIST-funded Center of Excellence for advanced materials research Center for Hierarchical Materials Design CHiMaD **Use-Case project on composites** may be of use for the Advanced Composites Institute.

NIST Labs Lead: Christopher Soles, MML

- **SMEs during RFP and Proposal Reviews:**
  - MML - Materials Science and Engineering
  - PML - Semiconductor and Dimensional Metrology

Future Technical Collaborations:

- NIST and AFRL have been discussing the a **shared laboratory space and beam line facilities at National Synchrotron Light Source** that would be dedicated to FHE processing.
- NIST had round table discussions with AFRL's Nano Bio Manufacturing Consortium on **standards development in flexible electronics**.
- NIST organized workshops and a symposium with the FlexTech Alliance related to **standards and metrology for printed and flexible electronics**
- The NIST-funded CHiMaD Center of Excellence for advanced materials research **Use-Case project on Organic Photovoltaics**.

NIST Lead –Gerry Fraser, PML

Proposal Evaluation Team Members:

- Gerald Fraser (PML), Sensor Science
- Bob Hickernell (PML), Electromagnetics
- Rich Mirin (PML), Quantum Electronics and Photonics
- Kartik Srinivasan (CNST)

Technical Collaborations (anticipated):

- Invited to participate in the metrology working group.
- NIST likely to share cost of multi-project wafer project, so allow space on the wafer for NIST projects
  - Well-characterized test structures
  - Measurements and Data on Optical Properties of materials
  - Embedding of "**NIST –on-a-chip**"

Lab Staff and the NNMIs

Three levels of engagement with NIST staff in the Laboratory Programs

- Discussions, meetings, workshops with industry sectors as ideas, concepts and challenges are being formulated.
- Sitting on the boards or advising the boards of established Institutes.
- Participating on technical projects at the request of established Institutes

NIST Commitment in the Partnership:

- Equipment
  - LIFT, NIST-on-a-chip, CHiMAD, ..
- Expertise
  - Staff knowledge in measurement science
- Standards Development Process
  - Staff engagement in the standards development process

KEY to Success:

- Align with existing NIST priorities
  - Lightweighting, Robotics, IOT, Standards, NIST-on-a-chip, metrology

Evolution of model/focus over time

Challenges/Risks/Plans for the Future

- Important for the NIST labs to both engage with the NNMIs, and ensure the strength of NIST's core competencies.
- The NNMIs are an organized and focused set of stakeholders where the Lab Programs can engage. We intend to pursue that engagement.
- As the NNMIs grow and flourish, the ability of the NIST labs to engage meaningfully may exceed the resources available.

Evaluation Criteria

- Alignment with NIST mission
- Map to NIST priorities
- Role/importance of Measurements and Standards