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ARL Micro-Compositronics and Rapid Operations (MiCRO) Lab:

Direct Write and Additive Manufacturing Facilities

U.S. ARMY RDECOM

ARL open campus

S&T Campaign: Materials Research
Unique ARL Facilities (APG)

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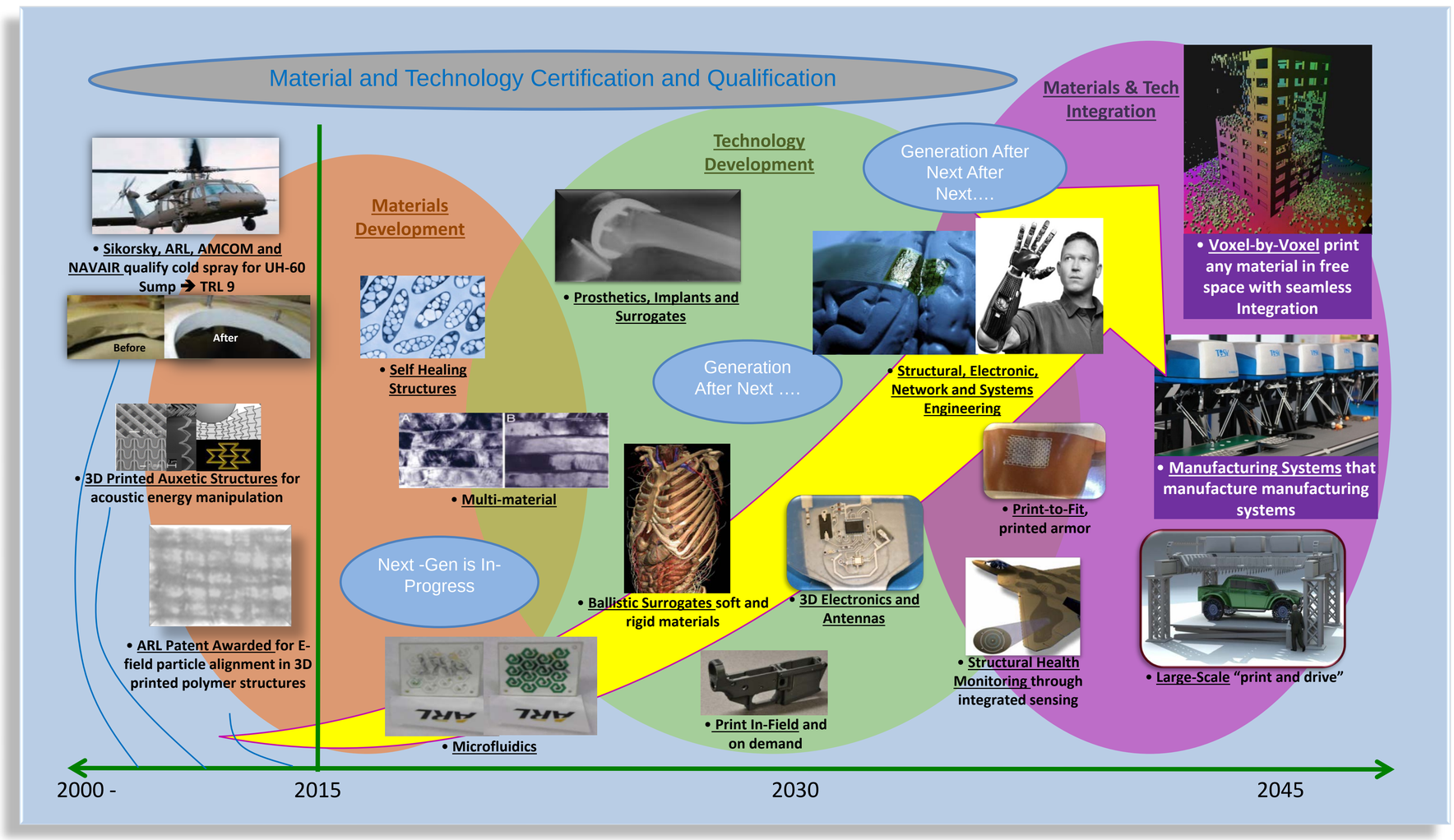
MiCRO Lab: An environment for the development of advanced manufacturing techniques and material feedstocks for future manufacturing.

Lab Goals

1) ***Development of Materials*** that are robust and versatile enough for Army applications

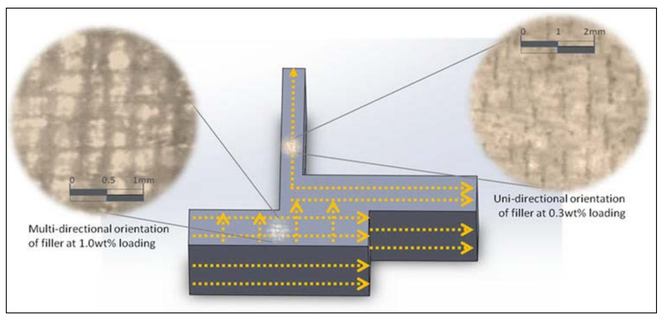
2) ***Bridge the Gap*** between Direct Write (DW) and Additive Manufacturing (AM) technologies

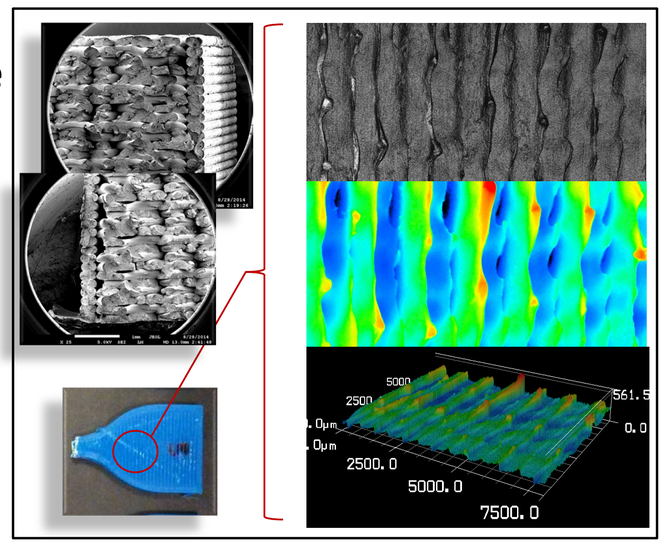
3) ***Hybridization*** of advanced processing and manufacturing technologies

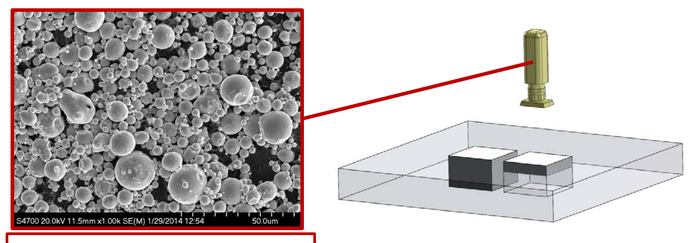


Unique ARL Facilities

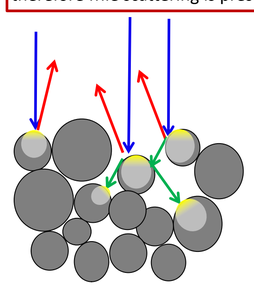
- **Full and open access to ALL of the processing parameters for all of the DW and AM equipment in the MiCRO lab**
- **Feedstock pedigree is 100% verifiable for the AM compliable polymers, metals, and ceramics that are created in-house**
- **Laser sintering/melting of metals and ceramics in one platform**
- **Field-aided vat polymerization for tailored internal structure of 3D composites**
- **Fiber reinforced thermoplastic micro-extrusion**
- **Multi-material vat polymerization**
- **Capillary Cold Spray**
- **PRINT, a roll-on deposition**



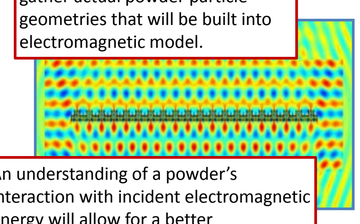




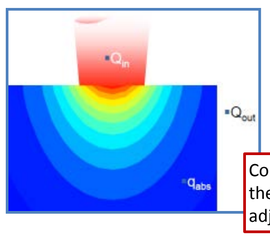
Typical metals powders are spherical and have dimensions proportional to the incident radiation's wavelength therefore Mie scattering is present

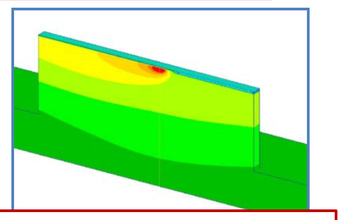


Built in powder bed imaging will gather actual powder particle geometries that will be built into electromagnetic model.



An understanding of a powder's interaction with incident electromagnetic energy will allow for a better understanding of how efficiently thermal energy is dissipated during a part's build

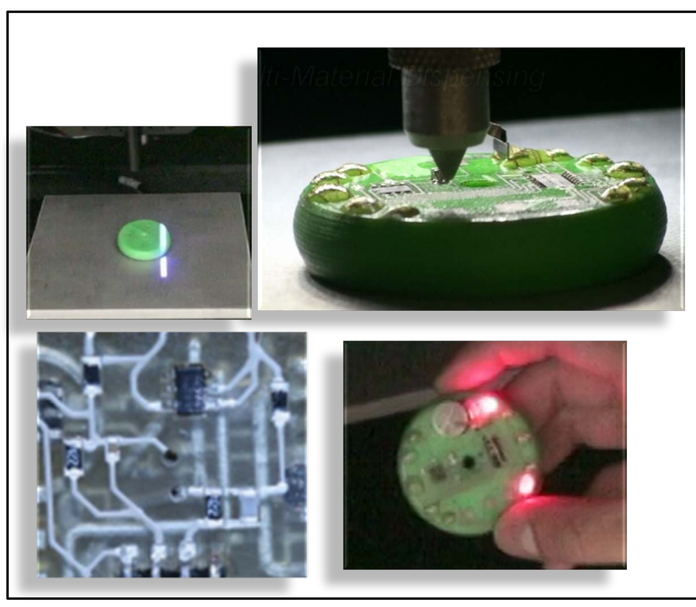




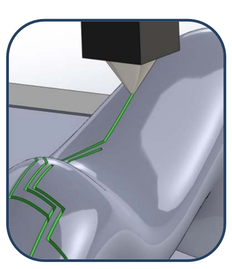
Coupling the electromagnetic model with a rigorous thermal-fluidic model, build parameters could be adjusted accordingly for any particle, of any material

Complementary Expertise Sought

- **In-situ characterization of matter-energy interaction**
- **Process modeling for geometric, topological and on-the-fly optimization**
- **Field-aided processing: electric field, magnetic field, acoustic field, etc.**
- **Materials and process development: conductive (5+ μΩ/sq), dielectric (50+ κ), exotic, etc.**
- **Design/development of conformal and awkward passive devices**



- Line Scanning of 3D objects
- Thermoplastic Extrusion (up to 400°) of filament, powder or pellet feedstock
- Thermoset Deposition
- Ink Deposition
- 6-Axis Motion Control
- Tool Switching
- Pick-n-Place
- Micro-milling
- Laser Sintering
- Aerosol Deposition
- Micro Cold Spray Deposition



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