Scott Smith
Section Head for Precision Manufacturing and Machining

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Career Summary Highlights

Scott Smith is a visionary leader and program builder with a 30+ year record of research and development, technical innovation, and successfully creating and building research and development teams and programs in manufacturing at the University of Florida, at the University of North Carolina at Charlotte, at the US Advanced Manufacturing National Program Office, and at Oak Ridge National Laboratory.

Smith became a faculty member at the University of Florida in 1987, and by 1992 he became the Associate Director of the Machine Tool Research Center (MTRC). The MTRC grew from inception into a multi-million-dollar research and development facility during his tenure. The MTRC became the largest machine tool research group at a university in the United States by 1997. Research sponsors included the Boeing Company, Bell Helicopter, B&W Y-12, Caterpillar, Cincinnati Machine, Curtiss Wright, General Dynamics, General Electric, General Motors, Giddings and Lewis, Kodak, Lockheed Martin, Lord Corporation, Makino, Mazak, the National Center for Manufacturing Sciences, the National Institute of Standards and Technology, the National Science Foundation, U.S. Air Force, U.S. Army, U. S. Navy, and Siemens.

Notable technical achievements at the University of Florida include the creation of the technology for manufacturing thin aerospace components as monolithic machined pieces rather than sheet metal assemblies. Boeing estimated that this technology saved billions of dollars in the F/A-18 E/F program alone. The technology is now widely used in commercial aerospace, automotive, and consumer electronics fields. In this time frame Smith also created a technology to automatically detect machine tool chatter, and to change the spindle speed to make this unwanted vibration stop. The technology is commercially available today under the trade names Harmonizer (Manufacturing Laboratories, Inc.), Machining NAVI (Okuma), Accord-Mill (ELPS), Autonomic Spindle (Makino).

Smith was recruited to build a machining and manufacturing program in the Center for Precision Metrology (CPM) at the University of North Carolina at Charlotte in 1997. By 2005 he was Deputy Director of the CPM, and he specified the machine tool space for the movement of the CPM and the Mechanical Engineering Department into a new building. By 2009 he became the Chair of the Mechanical Engineering Department at UNC Charlotte, and he spearheaded dramatic expansion of the department enrollment, which grew at 7 – 10% per year during his tenure. The department became one of the largest mechanical engineering departments in the United States by 2019.

Notable technical achievements at UNC Charlotte include the creation of a chip-breaking technology using machine tool axis motions. This technology is critical to glove box machining at the Y-12 National

Security Complex, and is commercially available from machine tool builder Citizen Marubi, and machine tool controller manufacturer Fanuc. In the same time frame Smith created a system for improving the precision of existing machine tools, Fiducial Manufacturing. Fiducial manufacturing is used to rapidly correct machine tool thermal errors, and it is particularly useful for machining of large-scale components.

In 2012-2013 Smith was recruited to serve in the US Advanced Manufacturing National Program Office (AMNPO), an inter-agency organization in Washington DC that was charged with creating the US Manufacturing Innovation Institutes, now called Manufacturing USA. In the role of Assistant Director for Technology, he worked collaboratively with the AMNPO and Federal agency staff from the Department of Defense, Department of Energy, Department of Commerce, Department of Education, and the National Science Foundation. He led the team that wrote the "National Network for Manufacturing Innovation: A Preliminary Design" document (http://manufacturing.gov/docs/nnmi_prelim_design.pdf).

In 2019 Smith was recruited to Oak Ridge National Laboratory to build a machine tool and precision machining capability in the Manufacturing Demonstration Facility. At ORNL, he was the catalyst for securing more than $55M in funding from the Department of Defense Industrial Base Analysis and Sustainment (IBAS) for a machine tool research and development program called America's Cutting Edge (ACE). He recruited the researchers and staff, and technicians that form the Intelligent Machine Tool Group, and he provided technical vision and leadership for ACE. In 2023, he became Section Head for Precision Manufacturing and Machining, overseeing the Intelligent Machine Tool Group, the Manufacturing Automation and Controls Group, the Manufacturing Systems Design Group, and the Robotics and Intelligent Systems Group. Machining and machine tools, with ACE funding at $10M/year, has become the cornerstone to essentially all the work at the MDF, including new funding in Castings and Forgings at $10M/year, Thermal Protection Systems at more the $10M/year, and AFRL Materials for Extreme Environments at approximately $6-10M/year. A new vision for materials for feedstocks, powder, and wire for additive manufacturing and hot isostatic pressing, for hypersonic, nuclear, fission and fusion parts also leverages machine tools at its core. The research and development in machining and machine tools has transformed the MDF and ORNL's capabilities to go from concept to real functional prototype parts.

Notable technical achievements at ORNL include the creation of a shop floor friendly measurement system for measuring machine tool performance capabilities. The technology is commercially available through MSC Industrial Supply under the trade name MillMax. More than 150 MSC metalworking specialists have been trained to make the measurement. On average, every time the measurement is made on a particular tool, the metal removal rate is improved by a factor of 4.7. As of August 2023, the technology has generated more than $19M in recurring annual cost savings and more than 200,000 hours of recurring cycle time savings for US manufacturers. In the same time frame, Smith created the technology for a small machine tool that can manufacture a large-scale part (like an aerospace wing rib). The prototype machine tool was exhibited at the 2022 International Manufacturing Technology Show (IMTS).

Smith is a Fellow of the International Academy for Production Engineering (CIRP), and he is a Fellow of both ASME and SME. Smith served as the Chair of the Manufacturing Engineering Division of ASME, and as President of the North American Manufacturing Research Institute of SME. He is author of more than

100 technical papers, and he is co-author of the books *Machining Dynamics: Frequency Response to Improved Productivity* and *Mechanical Vibrations: Modeling and Measurement*. He holds 14 patents, and he has taught numerous industrial short courses.

Smith has received prestigious manufacturing research and development awards including:

- the ASME/SME M. Eugene Merchant Manufacturing Medal, for "providing fundamental and translational research contributions that have improved the production of highly engineered components in the automotive and aerospace sectors",
- the ASME William T. Ennor Manufacturing Technology Award, for "innovations in the field of machining dynamics that have been commercially implemented, leading to significant improvements in machine tool performance and enabling the creation of thin monolithic machined structures in a variety of industries",
- the ASME Blackall Machine Tool and Gage Award, for "the best current original paper clearly demonstrating … a significant contribution to the manufacturing processes and systems for the design or application of machine tools, gauges, dimensional measuring instruments, or new manufacturing technologies and metrology approaches",
- the NAMRI/SME S.M. Wu Research Implementation Award, for "outstanding original research that, upon implementation, had a significant commercial and/or societal impact,
- the SME Education Award,
- the AMT Charles F. Carter Advancing Manufacturing Award,
- the American Helicopter Society Pinckney Award, for "a notable achievement in manufacturing research and development for vertical flight aircraft or components brought to fruition in the preceding year",
- a Federal Laboratory Consortium Technology Transfer Impact Award, for "securing domestic production of N95 masks during coronavirus pandemic",
- two R&D 100 Awards,
- the University of Florida MAE Outstanding Alumnus Award, and
- the NAMRI/SME Lifetime Service Award.

Professional Preparation

Tennessee Technological University	Mechanical Engineering	BS	(1983)
summa cum laude			
University of Florida	Mechanical Engineering	MS	(1985)
University of Florida	Mechanical Engineering	PhD	(1987)

Appointments

- **2022 – Present** Section Head for Precision Manufacturing and Machining
  Duties: Responsible for overseeing the Intelligent Machine Tool Group, the Manufacturing Automation and Controls Group, the Manufacturing Systems Design Group, and the Robotics and Intelligent Systems Group.
- **2019 – 2023** Group Leader for Machining and Machine Tool Research, Oak Ridge National Laboratory
  Duties: Responsible for coordinating, integrating, and transitioning all machining and machine tool design, sensing and control R&D at all scales at ORNL. Responsible for machine tool

collaboration leveraging the Manufacturing Demonstration Facility and industrial partners throughout the supply chain. Responsible to contribute significantly to strategic planning, program development, IP management, and scientific publications. Responsible to build and grow the Machining and Machine Tool Research Group, and to build a strong portfolio of people, projects, and equipment.

Example Accomplishments: Grew the Machining and Machine Tool Research Group from 0 to 10 members, and from 0 to 7 machines, with more on the way. Instrumental in acquiring major DOD funding, and multiple Technical Collaborations

Notable technical achievements:

- the creation of a shop floor friendly measurement system for measuring machine tool performance capabilities. The technology is commercially available through MSC Industrial Supply under the trade name MillMax. More than 150 MSC metalworking specialists have been trained to make the measurement. On average, every time the measurement is made on a particular tool, the metal removal rate is improved by a factor of 4.7. As of August 2023, the technology has generated more than $19M in recurring annual cost savings and more than 200,000 hours of recurring cycle time savings for US manufacturers.
- The creation of a technology for a small machine tool that can manufacture a large-scale part (like an aerospace wing rib). The prototype machine tool was exhibited at the 2022 International Manufacturing Technology Show (IMTS).

- **2009-2019** UNC Charlotte, Charlotte, NC, Chair, Dept. of Mechanical Engineering
  Duties: Responsible for leadership of a department with 50 faculty, 1053 undergraduate students, 168 graduate students, and more than $2.5M in externally funded research.
  Example Accomplishments: The department grew approximately 7% per year during this time. Built one of the strongest university manufacturing faculties in the world including 6 Fellows of the prestigious International Academy for Production Engineering (CIRP). Design and build philosophy was woven throughout the undergraduate curriculum. Built an initially small summer program into a full semester (>1800 student credit hours in 2017). Built a strong department-sponsored Research Experiences for Undergraduates program using the NSF REU program as a model. Created undergraduate concentrations in Motorsports, in Energy, in Biomedical, and in Precision under development.
- **2018 – 2021** SME Smart Manufacturing Community Advisor
- **2015 – 2021** MForesight Leadership Council
- **1997 – 2019** UNC Charlotte, Professor
- **2003-2019** Manufacturing Laboratories, Inc., Charlotte, NC, Vice-President and founder
  MLI provides measurement and simulation hardware, software, training, and consulting for machining optimization.
- **2009 – 2019** Board of Directors, Polymers Center of Excellence
- **2012 – 2019** Board of Directors, BlueSwarf, LLC
- **2001-2019** OpSource, Inc., Charlotte, NC, President
  OpSource was an engineering consulting company
- **2012-2013** US Advanced Manufacturing National Program Office, Washington, DC, Assistant Director for Technology
  Duties: Work collaboratively with the AMNPO and Federal agency staff to plan, design, and develop formal documents for announcements, and solicitations for the National Network for

Manufacturing Innovation (NNMI). Responsible for physical and electronic outreach to non-Federal stakeholders to ensure effective whole-of-government interface communications for advanced manufacturing.
Example Accomplishments: Part of the team that wrote the "National Network for Manufacturing Innovation: A Preliminary Design" document (http://manufacturing.gov/docs/nnmi_prelim_design.pdf). This work built on input from more than 900 individual stakeholders to lay out the plan for a US network of manufacturing innovation institutes. Led the interagency team that developed the "Draft Institute Performance Metrics for the National Network for Manufacturing Innovation" (http://manufacturing.gov/docs/nnmi_draft_metrics.pdf). Led workshop discussion in 3 different "Designing for Impact" workshops to solicit public input on the network design, and reported the results in a "Blueprint for Action" workshop. Redesigned the manufacturing.gov website. Communicated the NNMI vision to numerous stakeholders including companies, professional organizations such as CIRP, ASME, SME, public and private universities and state and local economic development organizations. Recruited future AMNPO staff.

- **2005 – 2009** Deputy Director of the Center for Precision Metrology at UNC Charlotte
  Notable technical achievements:
  - the creation of a chip-breaking technology using machine tool axis motions. This technology is critical to glove box machining at the Y-12 National Security Complex, and is commercially available from machine tool builder Citizen Marubi, and machine tool controller manufacturer Fanuc.
  - The creation of a system for improving the precision of existing machine tools, Fiducial Manufacturing. Fiducial manufacturing is used to rapidly correct machine tool thermal errors, and it is particularly useful for machining of large-scale components.
- **1997- 2009** Professor, Department of Mechanical Engineering, Center for Precision Metrology, UNC Charlotte
- **1992-1997** Associate Director of the Machine Tool Research Center Associate Professor, Department of Mechanical Engineering, University of Florida
- **1995-1996** Visiting Professor, University of North Carolina at Charlotte
- **1987-1992** Assistant Professor, Department of Mechanical Engineering, University of Florida
  Research Areas: Chip Breaking, Precision in Machine Tools, Hybrid Machining and Forming Processes, Dynamics of Metal Cutting and Machine Tools, Machining of Monolithic Thin-Walled Structures, Vibrations, High-Speed, High-Power Milling, Chatter Detection and Avoidance, NC Programming for Productivity and Novel Structures, Cutting Performance Testing for Machine Tools, Tool-Holder-Spindle Design, Modeling and Simulation of Machining Processes
  Research sponsors include: The Boeing Company, Bell Helicopter, B&W Y-12, Caterpillar, Cincinnati Machine, Curtiss Wright, General Dynamics, General Electric, General Motors, Giddings and Lewis, Kodak, Lockheed Martin, Lord Corporation, Makino, Mazak, the National Center for Manufacturing Sciences, the National Institute of Standards and Technology, the National Science Foundation, U.S. Air Force, U.S. Army, U. S. Navy, Siemens
  Courses Taught:
  (Undergraduate) Analytical Methods, Dynamics, Individual Projects, Instrumentation and Measurements, Manufacturing Processes, Machine Analysis and Design, Machine Dynamics, Vibrations, Statics

(Graduate) Advanced Manufacturing Processes, Advanced Vibrations, Design Synthesis in Vibrations, Structural Dynamics of Production Machinery, Individual Projects

Notable technical achievements:

- The creation of the technology for manufacturing thin aerospace components as monolithic machined pieces rather than sheet metal assemblies. Boeing estimated that this technology saved billions of dollars in the F/A-18 E/F program alone. The technology is now widely used in commercial aerospace, automotive, and consumer electronics fields.
- The creation of a technology to automatically detect machine tool chatter, and to change the spindle speed to make this unwanted vibration stop. The technology is commercially available today under the trade names Harmonizer (Manufacturing Laboratories, Inc.), Machining NAVI (Okuma), Accord-Mill (ELPS), Autonomic Spindle (Makino).

- **1986- present** Consulting Engineer

Example projects include:

- McDonnell-Douglas sponsored high-speed machining research and application program for the Standards and Industrial Research Institute of Malaysia (7 months in Kuala Lumpur, Malaysia)
- Specifications for machine tools and machining processes for US Navy
- Boeing-sponsored high-speed machining project in Kaohsiung, Taiwan
- Machining vibration remediation for Alcoa, Apple, General Motors, Ford, Boeing
- Thin part process planning for Sikorsky
- Machining analysis for Eaton transmission housings
- Measurements of machine tool performance for Ingersoll Milling Machine, Cooper Tire, and Aerostructures
- Stability measurement, analysis and redesign of spindle attachments for a large General Motors die-manufacturing cell
- Finite element modeling of rotors for high-speed Setco spindles
- Dynamic analysis of high-speed spindle designs for United Technologies (Carrier)
- Signal standard vibration analysis for CSX
- Vibration remediation in paper making for Georgia Pacific

- **1985-1987** Chief Engineer, Machine Tool Laboratory, University of Florida
- **1983-1987** Teaching Assistant, University of Florida

Professional Activities and Awards:

ASME (American Society of Mechanical Engineers) Activities

- Chair of the M. Eugene Merchant Manufacturing Medal Committee (2023 – present)
- Milton C. Shaw Manufacturing Medal Committee (2013-2016)
- Member at Large for the Manufacturing Technology Group to the Committee on Divisions Operation and Training (2011-2014)
- Blackall Tool and Gage Award Committee (2010-2013)
- William T. Ennor Manufacturing Technology Award Committee (2010-2013)
- Manufacturing Engineering Division (MED) Advisory Committee (2008-2009)
- MED Past Chair (2005-2006)
- MED Chair (2004-2005)

- MED Vice Chair (2003-2004)
- MED Executive Committee Member and Student Design Competition Chair (2002-2003)
- MED Secretary (2001-2002)
- MED Executive Committee Member (2000-2001)
- Membership Development Committee (2000-2001)
- Associate Technical Editor ASME Journal of Engineering for Industry (1994-1995)
- Gator Section Chair (1990-1992)
- Gator Section Membership Development (1989-1992)
- Tennessee Tech Student Section Chairman (1983-1984)
- Tennessee Tech Student Section Vice Chair (1982-1983)
- Tennessee Tech Technical Program Chair (1981-1982)

ASME Awards

- M. Eugene Merchant Manufacturing Medal (2021)
- William T. Ennor Manufacturing Technology Award (2018)
- Blackall Machine Tool and Gage Award (2009)
- Fellow (2007)

CIRP (International Academy for Production Engineering) Activities

- Member of the Council (2019 – present)
- Member of the Nominations Committee (2019 – present)
- Chair of the US Fellows Group (2019 – present)
- Chair of the Editorial Committee (2015 – 2018)
- Vice Chair of the Editorial Committee (2013 -2015)
- Member of the Editorial Committee (2010-2012)
- Chair of the Scientific and Technical Committee on Machines (STC M) (2009-2011)
- Vice-Chair of STC M (2006-2008)
- Secretary of STC M (2003-2005)
- Chair of the Working Group on Tool-Machine Connection (2001-2004)

CIRP Awards

- Fellow (2006)

SME (Society of Manufacturing Engineers) Activities

- Chair of the M. Eugene Merchant Medal Award Committee (2023 – present)
- Member of the M. Eugene Merchant Medal Award Committee (2021 – 2023)
- Chair of the International Awards and Recognition Committee (IARC) (2013 – 2019)
- President of the North American Manufacturing Research Institute (NAMRI) (2008-2009)
- NAMRI Vice-President (2007-2008)
- NAMRI Secretary (2006-2007)
- Chair of the NAMRI Scientific Committee (2005-2006)
- Organizer of the 2004 NAMRI Conference at UNC-Charlotte
- NAMRI Board of Directors (2002-2004)

SME Awards

- NAMRI Founders Lecture (2023)

- M. Eugene Merchant Manufacturing Medal (jointly with ASME, “for fundamental and translational research contributions that have improved both material removal rates and accuracy in highly engineered components in the automotive and aerospace sectors.” (2021)
- NAMRI/SME Lifetime Service Award (2018)
- NAMRI/SME S.M. Wu Research Implementation Award (2012)
- SME Education Award (2011)
- Fellow (2008)
- Outstanding Young Manufacturing Engineer Award (1992)

SAE Activities
- Faculty Advisor for University of Florida Mini-Baja (1990-1993)
- Faculty Advisor for University of Florida Formula SAE (1990-1993)

SAE Awards
- Ralph R. Teetor Educational Award (1991)

Pi Tau Sigma Activities
- Faculty Advisor for University of Florida Pi Tau Sigma (1993-1997)

Other Honors and Awards:
- Federal Laboratory Consortium for Technology Transfer Impact Award for “Securing Domestic Production of N95 Masks During Crornavirus Pandemic”
- Inaugural Tlusty Manufacturing Lecturer, University of Florida (2019)
- R&D 100 Awards (2010, 2021)
- University of Florida MAE Outstanding Alumnus Award (2010)
- Association for Manufacturing Technology Charles F. Carter Advancing Manufacturing Award (2006)
- American Helicopter Society Pinckney Award (“in recognition of notable achievement in manufacturing research and development for rotorcraft or rotorcraft components brought to fruition in recent years”) (2003)
- UNC Charlotte Undergraduate Teaching Award (1998)
- University of Florida Teaching Award (1994)
- University of Florida Machine Tool Fellowship (1986-1987)
- Derryberry Award (Outstanding Graduating Senior), Tennessee Technological University (1983)

American Society for Precision Engineering: Member

Patents
1. Stability boundary and optimal stable parameter identification in machining (Pending US20220161381A1)
2. Manufacturing Methods and Systems Using Sacrificial Structure Preforms (U.S. Patent #9,375,818)
3. Deformation Machining Systems and Methods (U.S. Patent # 8,545,142)

4. Method and Apparatus for Characterizing and Enhancing the Functional Performance of Machine Tools (U.S. Patent # 8,432,119)
5. Dynamic Metrology Methods and Systems (U.S. Patent # 8,401,691)
6. Manufacture of Large Parts on Small Machines (U.S. Patent # 8,313,271)
7. Methods and Systems for Chip Breaking in Turning Applications using CNC Tool Paths (U.S. Patent # 8,240,234)
8. Methods and Systems for Creating Assemblies (U.S. Patent # 8,230,572)
9. Methods for Creating Assemblies and Disassembling (U.S. Patent # 7,770,278)
10. Variable Tuned Holder for Machine Tools (U.S. Patent # 7,730,813)
11. Damping Products and Processes (U.S. Patent # 7,427,179)
12. Method and System for Optimizing Manufacture of Parts (U.S. Patent # 7,177,713)
13. Variable Tuned Holder for Machine Tools (International Patent # WO2006010093A1)
14. Explosive Excitation Device and Method (U.S. Patent # 6,655,189)