

BINIL STARLY, Ph.D., James T. Ryan Professor, NC State University, USA

Researcher, Engineer, Teacher

Binil Starly, Ph.D. is the Director of the DIME (Data Intensive Manufacturing Environment) Lab at North Carolina State University. His laboratory is working on technologies that merge the digital and the physical world towards advancing both discrete and continuous manufacturing processes. His specific technical expertise is in digital design and fabrication, reverse engineering, additive manufacturing and biofabrication processes. His work is supported by the US National Science Foundation and the Department of Defense. Advanced automation processes, particularly intelligent machines and cyber-physical manufacturing processes will impact every manufacturing industry, including the healthcare industry. For more details, visit [W: http://www.dimelab.org](http://www.dimelab.org).

Professional Appointments



Career Stats



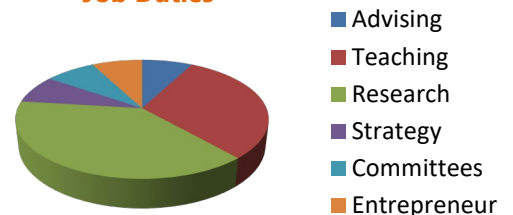
Courses Taught

- Product Development
- Digital Manufacturing
- CAD/CAM
- Additive Manufacturing
- Mfg. for Regenerative Medicine



Research Interests

- Biomedical Implants
- Regenerative Medicine Mfg.
- Additive Manufacturing
- Intelligent Machines
- Cyber-Physical Manufacturing

Job Duties



Education

	Ph.D. '06 (Mechanical Engineering)	Drexel University Philadelphia, PA, USA.
	B.Tech '01 (Mechanical Engineering)	Kerala University College of Engineering Trivandrum, Kerala, India.

BINIL STARLY

James T. Ryan Professor in Industrial & Systems Engineering

Edward P. Fitts Department of Industrial and Systems Engineering

North Carolina State University, Raleigh, NC 27695

Data Intensive Manufacturing Environment (DIME) Laboratory, <http://www.dimelab.org>

EDUCATION

University of Kerala, India	Mechanical Engineering	B.S., 2001
Drexel University, Philadelphia, USA	Mechanical Engineering	Ph.D., 2006

APPOINTMENTS

2018 – present	Tenured Professor	James T. Ryan Professor (2020 - 2024), Industrial & Systems Engineering, North Carolina State University
2017 – 2019	Co-Director	Functional Tissue Engineering Group, Comparative Medicine Institute
2013 – 2018	Tenured Associate Professor	Edward P. Fitts Department of Industrial and Systems Engineering, North Carolina State University, Raleigh, NC.
2012 – 2013	Tenured Associate Professor	Industrial and Systems Engineering, University of Oklahoma, Norman, Oklahoma.
2010 – 2012	R&D Director	SEAM Aero, LLC, Norman, OK. (Co-Founder)
2006 – 2012	Tenure Track Asst. Professor	Industrial and Systems Engineering, University of Oklahoma, Norman, Oklahoma.
2002 – 2006	Research Assistant	Mechanical Engineering and Mechanics & Rapid Product Development Center, Drexel University, Philadelphia, PA.

CORE SKILLS

- **Creativity** in R&D Strategy: Known for infusion of new ideas and approaches in manufacturing through study of related disciplines and adapting them to manufacturing problem scenarios.
- **Collaboration:** Worked with 30 investigators spanning computer science, operations research, microeconomics and broad engineering disciplines. Principle Investigator on more than \$5M in direct project awards.
- **Communication:** Numerous invited presentations at regional and international conferences. Successful at written communication through peer reviewed journal publications, project reports and proposals.
- **Critical Thinking:** Focus on the user requirements through voice of customer, rapid iterations in solutions buildup through early prototypes and critical examination of solution pathways from technical, business and legal perspectives.
- **Mentorship:** Trained more than 2 post-doctoral, 10 doctoral, more than 20 master's students and numerous undergraduate research advisees over the 14yrs. Many of them are successful at leading international companies.

RESEARCH AND TEACHING INTERESTS

Research

- Cyber-Physical Systems in Manufacturing
- Decentralized Manufacturing Marketplaces

- Manufacturing Processes in Regenerative Medicine
- Biofabrication Platforms for Personalized Biomedical Implants/Scaffolds

SELECTED RECENT & RELEVANT TECHNICAL PROJECTS

- **Blockchain in Manufacturing (2017-2020):** Demonstrated the first use case of physical manufacturing machines communicating with the global Ethereum blockchain through implementation of smart contracts and digital twins. Designed a solutions architecture connecting the digital thread across the product lifecycle.
- **Knowledge Graphs in Product Design and Manufacturing (2019-2020):** Funded by the federal government, an initial prototype of a scalable 3D model search via geometric deep learning with proof of concept demonstrated with more than 100K+ component models. Web-crawled through 20K+ small manufacturing services websites for relationship extraction to build the Knowledge Graph in product design and manufacturing.
- **Real-Time Monitoring in Bioprinting for Inspection & Verification (2015-2020):** The very first demonstrated study on the use of impedance spectroscopy as a tool to measure critical biological attributes of living bioprinted constructs. Funded by the federal government through National Science Foundation and Department of Defense.
- **Upgrading Legacy Machines to Industry 4.0 (2015):** Retrofitted legacy manufacturing machines with sensors and system-on-chip open platforms to enable machine communication through MT-Connect protocols and information systems. Funded by the Department of Defense through MxD Institute.

HONORS AND AWARDS

SME 20 Most Influential Professors in Smart Manufacturing, 2020
 James T. Ryan Professor, 2020 - 2024
 Clifton Anderson, Outstanding Faculty Award, 2018
 Society of Manufacturing Engineering (SME) - 2011 Young Manufacturing Engineering Award
 NASA TechBrief 2010 Award, "Micro-organ device"
 University of Oklahoma Teachers Scholars Initiative (TSI) Colloquium award, 2010
 NSF CAREER Award, 2009
 SME Dick Aubin Distinguished Paper Award, RAPID 2008
 University of Oklahoma Alumni Teaching Award, 2007, 2008, 2009
 Most Likely to Enhance Drexel's Reputation Award, 2006
 Graduate Research Excellence, Drexel University, 2006
 George Hill Jr. Fellowship, College of Engineering, Drexel University, 2005-2006
 Graduate Research Award, College of Engineering, Drexel University, 2006
 Teaching Excellence Award, Drexel University, 2005
 Outstanding Service Award, Mechanical Engineering and Mechanics, Drexel Univ. 2006
 Joseph E. Caroleone Award for Academic Merit, 2004-2005.

TECHNICAL SKILLS

CAD/CAM/PLM:	PTC Creo, SolidWorks, Autodesk Product Design Suite (Fusion 360)
Analysis & Simulation:	ANSYS, STARCD, COMSOL, ABAQUS
Computing Skills	Python and its Libraries, C++, Matlab, MEAN Web Programming Stack, Cloud Computing (Amazon S3, EC2 & ElasticBean Stalk and Google Cloud)
Reverse Engineering:	Laser Scanners (LEICA, FARO, Konica), Geomagics, MIMICS
3D Printing Systems:	Binder based Powder Bed, Polymer Extrusion and UV Photopolymer Systems

BOOKS & BOOK CHAPTERS

1. **B. Starly**, R. Shirwaiker, “Three-Dimensional Bioprinting Techniques”, Book Chapter in 3D Bioprinting and Nanotechnology in Tissue Engineering, L. Zhang, J. Fisher and K. Leong (ed.), Elsevier, 2015, ISBN: 978-0-12-800547-7.
2. **B. Starly**, “Computer-Aided Process Planning for the Layered Fabrication of Porous Scaffold Matrices”, Book Chapter in Printed Biomaterials, Roger Narayan and Y.S. Lee., Springer Verlag, New York 2010, ISBN: 978-1-4419-1394-4.
3. **Starly, B.** and Sun, W., “Biomimetic Design and Fabrication of Tissue Engineered Scaffolds”, VDM Verlag, 2007, ISBN: 978-8364-2464-6.

SELECTED PEER REVIEWED JOURNAL PUBLICATIONS (OUT OF 45)

Over 3430 citations recorded by Google Scholar, h-index 24

<https://scholar.google.com/citations?user=o12GBQMAAAAJ&hl=en>

**Bold Underline indicates contact author status. Dr. Starly's name at the beginning of the author list indicates primary authorship of the research work. It is his policy to place the student's name as the primary author of any work in Dr. Starly's laboratory. Students/Post-Docs are in italics. Impact factors (IF) are reported for the year in which the publication appears.*

1. *Atin Angrish, A. Bharadwaj, **Binil Starly***, “MVCNN++: CAD Model Shape Classification and Retrieval using Multi-View Convolutional Neural Networks”, *ASME J. Comput. Inf. Sci. Eng. (JCISE)*, 2020 (accepted) [IF 1.71]
2. *Mahmud Hasan, **Binil Starly***, “Decentralized Cloud Manufacturing-as-a-Service (CMaaS) Platform Architecture with Configurable Digital Assets”, *Journal of Manufacturing Systems*, 2020, (accepted). [IF 3.6]
3. Sun, Wei; **Starly, Binil**; Daly, Andrew; Groll, Juergen; Cho, Dong-Woo; Takeuchi, Shoji; Burdick, Jason; Nie, Minghao; Khademhosseini, Ali; et.al, “The bioprinting roadmap”, *Biofabrication*, 2020, accepted [IF 7.3]
4. *Deepak Pahwa, **Binil Starly***, “Network Based Pricing for 3D Printing Services in Two-Sided Manufacturing-as-a-Service Marketplace”, *Rapid Prototyping Journal*, 26/1 (2020) 82–88. <https://doi.org/10.1108/RPJ-01-2019-0018> [IF 2.8]
5. *Atin Angrish, Benjamin Craver, **Binil Starly***, “FabSearch”: A 3D CAD Model Based Search Engine for Sourcing Manufacturing Services, *J. Comput. Inf. Sci. Eng.* 2019;19(4):041006-041006-10 [IF 1.58]
6. *L.K. Narayanan, T. L. Thompson, R.A. Shirwaiker, **B. Starly***, "Label Free Process Monitoring of 3D Bioprinted Engineered Constructs via Dielectric Impedance Spectroscopy, *Biofabrication*, 2018. Jun 28;10(3):035012 [IF 6.83]
7. *Deepak Pahwa, Paul Cohen, **Binil Starly***, “Reverse Auction Mechanism Reverse Auction Mechanism Design for the Acquisition of Prototyping Services in a Manufacturing-as-a-Service Marketplace, *Journal of Manufacturing Systems*, 2018, Volume 48, Part C, July 2018, Pages 134-143. [IF 2.77]
8. Patrick W. Sweeney, **Binil Starly**, *Yiming Xu, Aimee Jones, Sridhar Radhakrishnan, Charles C. Davis*, “Large-scale digitization of herbarium specimens: development and usage of an automated, high-throughput conveyor system”, *Taxon.*, 2018, Vol 67(1).pp 165-178 [IF 2.45]

9. *Atin Angrish, **Binil Starly**, Yuan-Shin Lee, Paul Cohen, “A Flexible Data Schema and System Architecture for the Virtualization of Manufacturing Machines (VMM), *Journal of Manufacturing Systems*, 2017, 45:236-247 [IF 2.77]*
10. *Jianlei Zhang, **Binil Starly**, Yi Cai, Paul H. Cohen, Yuan-Shin Lee, "Particle Learning in Online Tool Wear Diagnosis and Prognosis", *Journal of Manufacturing Processes*, 2017, Vol 28 (3); 457-463 [IF 1.77]*
11. *R. Nordberg, J. Zhang, M. Frank, E. Griffith, E. Lobo, **B. Starly**, “Electrical Cell-Substrate Impedance Spectroscopy Can Monitor Age-grouped hASC Variability During Osteogenic Differentiation”, *Stem Cells Translational Medicine*, Vol 6(2), 2017 [IF 5.0].*
12. *L. K. Narayanan, P. Huebner, M.B. Fisher, J.T. Spang, **B. Starly**, R.A. Shirwaiker, “3D-Bioprinting of Polylactic Acid (PLA) Nanofiber-Alginate Bioink with Human Adipose-Derived Mesenchymal Stem Cells for Fibrous Musculoskeletal Tissue Engineering Applications”, *ACS Biomaterials Science and Engineering*, Vol 2(10), Pg. 1732-42 2016.[IF 3.23]*
13. *Arun Kumar, **Binil Starly**, “Large Scale Industrialized Cell Expansion: Producing the Critical Raw Material for Biofabrication Processes”, *Biofabrication*, 2015, Vol 7, 044103. [IF:4.7]*
14. *Rachel Dreher, **Binil Starly**, “Biofabrication of Multi-material 3D Constructs Embedded with Patterned Alginate Strands Encapsulated with PC12 Neural Cell Lines”, *ASME Journal of Nanotechnology in Engineering and Medicine*, May 2015, Vol. 6(2)/0210003. [IF:0.79]*
15. *Lan, S.F., Kehinde T., Zhang X., Schmidtke, D., Khajotia, Sharukh, **Starly, B.**, “Controlled Release of Metronidazole from Composite Poly-ε-Caprolactone/Alginate Rings for Dental Implants”, *Dental Materials*. 2013 Jun; 29(6):656-65. [IF:4.4]*
16. *Davies, K., **Starly, B.**, “Virtual and Real: Using 3D Scanning, Modeling and Printing in Reconstructing a Juvenile Apatosaurus Skeleton”, *Journal of Vertebrate Paleontology*, 31(2), 2011. [IF:2.37]*
17. *Lan, S.F., **Starly, B.**, “Alginate based 3D Hydrogels as an In Vitro Co-Culture Model Platform for the Toxicity Screening of New Chemical Entities”, *Toxicology and Applied Pharmacology*, 256 (2011), Pages 62–72. [IF:4.07]*
18. *Padmanabhan, T., Kamaraj V., Magwood, L., **Starly, B.**, “Experimental Investigation on the Operating Variables of a Near-Field Electrospinning Process via Response Surface Methodology”, *Journal of Manufacturing Processes*, Vol. 13(2), pp. 104-112, 2011. [IF:1.77]*
19. *Shih Feng Lan, Barbara Mroczka, **Binil Starly**, “Long-term cultivation of HepG2 Liver Cells Encapsulated in Alginate Hydrogels: A Study of Cell Viability, Morphology and Drug Metabolism”, *Toxicology In Vitro*, Volume 24, Issue 4, June 2010, 1314-1323. [IF:3.069]*
20. *Parthasarathy J., Raman S., Christensen A. **Starly, B.**, "Mechanical Evaluation of Porous Titanium (Ti6Al4V) structures with Electron Beam Melting (EBM)", *Journal of Mechanical Behavior of Biomedical Materials*, Volume 3, Issue 3, April 2010, 249-259. [IF:3.47]*
21. *Ozlem Yasar, Shih-Feng Lan, **Binil Starly** “A Lindenmayer systems based approach for the design of nutrient delivery networks in tissue constructs”, *Biofabrication*, Vol. 1, Issue 4, 2009. [IF:4.7]*
22. *A. Choubey, **B. Starly**, "Real Time In-Vitro Measurement of Oxygen Uptake Rates for HEPG2 Liver Cells Encapsulated in Alginate Matrices", *J. of Microfluidics and Nanofluidics*, Volume 6, Issue 3, 2009, Page 373. [IF:2.7]*
23. *J.H. Piatt, **B. Starly**, E. Faerber, W. Sun, “Application of computer-assisted design in craniofacial reconstructive surgery using a commercial image guidance system”, *J. of Neurosurgery*, 2006 Jan; 104(1 Suppl.):64-7. [IF 3.74]*

24. **Starly B.**, Lau W., Bradbury, T., Sun W., “Internal architecture design methodology for tissue replacement structures”, *Computer Aided Design*, Vol. 38 (2), 2006, Pages 115-124. [IF:1.957]
25. Sun, W., **Starly, B.**, Nam, J. and Darling, A., “Bio-CAD Modeling and Its Applications in Computer-Aided Tissue Engineering”, *Computer-Aided Design*, Vol. 37 (11), 2005, 1097-1114. [IF:1.957]
26. **Starly, B.**, Lau, A., Sun, W. Lau, W. and Bradbury T., “Direct Slicing of STEP Based NURBS Models for Layered Manufacturing,” *Computer-Aided Design*, Vol. 37, Issue 4, 2005, pp 387-397. [IF:1.957]
27. Wettergreen MA, Bucklen B.S., **Starly, B.**, Yuksel E., Sun W and Liebschner MAK, “Creation of a Unit Block Library of Architectures for Use in Assembled Scaffold Engineering”, *Computer-Aided Design*, Vol. 37 (11), 2005, 1141-1149. [IF:1.957]
28. Fang, Z., **Starly, B.** and Sun, W., “Computer-Aided Characterization of Effective Mechanical Properties for Porous Tissue Scaffolds,” *Computer-Aided Design*, Vol. 37, No. 1, 2005, pp. 65-72. [IF:1.957]
29. Sun, W., Darling, A., **Starly, B.**, Nam, J., “Computer-Aided Tissue Engineering: Overview, scope and challenges”, *Biotechnology and Applied Biochemistry*, Vol. 39, Issue 1, 2004, pp. 29-47. [IF:1.429]
30. Nam, J., **Starly, B.**, Darling, A. and Sun, W., “Computer Aided Tissue Engineering for Modeling and Design of Novel Tissue Scaffolds” *J. of Computer-Aided Design and Application*, Vol. 1, No. 1-4, 2004, pp. 633-640. [IF:0.47]

SELECTED PEER REVIEWED CONFERENCE PROCEEDINGS (OUT OF 53)

1. *Nabeel S. Mehdi*, **Binil Starly**, "A Simulator for MT-Connect Based Machines in a Scalable and Federated Multi-Enterprise Environment", Proceedings of the 2019 Winter Simulation Conference N. Mustafee, K.-H.G. Bae, S. Lazarova-Molnar, M. Rabe, C. Szabo, P. Haas, and Y.-J. Son, eds.
2. *Maaz Saleem Kapadia*, **Binil Starly**, *Alec Thomas*, Reha Uzsoy, Donald Warsing, “Impact of Scheduling Policies on the Performance of an Additive Manufacturing Production System”, 25th International Conference on Production Research Manufacturing Innovation: Cyber Physical Manufacturing, August 9-14, 2019, Chicago, Illinois (USA).
3. *H. Latif*, G. Shao, **B. Starly**, “Integrating A Dynamic Simulator and Advanced Process Control Using the OPC-UA Standard”, North American Manufacturing Research Conference 47, June 10-14th, 2019, Erie, Pennsylvania.
4. *R. Sherlekar*, P. Cohen, **B. Starly**, “Provisioned Data Distribution for Intelligent Manufacturing via Fog Computing”, North American Manufacturing Research Conference 47, June 10-14th, 2019, Erie, Pennsylvania.
5. *A. Angrish*, *B. Craver*, *M. Hasan*, **B. Starly**, “A Case Study for Blockchain in Manufacturing: “FabRec”: A Prototype for Peer-to-Peer Network of Manufacturing Nodes”, North American Manufacturing Research Conference 46, June 18-22nd, 2018, Texas A&M, College Station, Texas.
6. *A. Angrish*, *B. Craver*, *X. Xu*, **B. Starly**, “A Search Engine for Manufacturers Using Product Manufacturing Information (PMI) Enhanced 3D Model Search”, 2018 ASME International Manufacturing Science and Engineering Conference (MSEC), June 18-22, 2018, Texas A&M, College Station, Texas.
7. *Deepak Pahwa*, **Binil Starly**, “A Multi Agent based Manufacturing Service Marketplace: Towards Intelligent Cloud Manufacturing Services”, 2018 IISE Annual Conference, K. Barker, D. Berry, C. Rainwater, eds.

8. Yi Cai, **Binil Starly**, Yuan-Shin Lee, “Sensor Fusion for Digitalization of Legacy Machine Tools”, Proceedings of the 2018 IISE Annual Conference, K. Barker, D. Berry, C. Rainwater, eds.
9. Atin Angrish, Benjamin Craver, Mahmud Hasan, **Binil Starly**, "A Case Study for Blockchain in Manufacturing: “FabRec”: A Prototype for Peer-to-Peer Network of Manufacturing Nodes", accepted with minor revision, *Procedia Manufacturing* 2018
10. Atin Angrish, Benjamin Craver, Xiwen Xu, **Binil Starly**, "A Search Engine for Manufacturers using Product Manufacturing Information (PMI) Enhanced 3D Model Search", accepted with minor revision, 2018 ASME MSEC, College Station, Texas A&M.
11. A. Kumar, W. Lau, **B. Starly**, “Human Mesenchymal Stem Cells Expansion on Three-Dimensional (3D) Printed Poly-Styrene (PS) Scaffolds in a Perfusion Bioreactor”, *2017 Procedia CIRP, Volume 65, 2017, Pages 115-120.*
12. L. Narayan, T. Thompson, **B. Starly**, R. Shirwaiker, “Non-destructive Real-time Quality Assessment of 3D-Biofabricated Constructs using Dielectric Impedance Spectroscopy”, *Proceedings of the 2017 Industrial and Systems Engineering Research Conference (ISERC), Pittsburgh, PA. – 2017 IIE ISERC Student Best Paper Award.*
13. Yi Cai, **Binil Starly**, Shaurabh Singh, Paul Cohen and Yuan-Shin Lee, “Sensor Data and Information Fusion to Construct Digital-Twins Virtual Machine Tools for Cyber-Physical Manufacturing”, *2017 Procedia Manufacturing, 10, 1031 – 1042.*
14. Shaurabh Singh, Atin Angrish, **Binil Starly**, James Barkley, Yuan-Shin Lee, Paul Cohen, "Streaming Machine Generated Data to Enable a Third-Party Ecosystem of Digital Manufacturing Apps", *2017 Procedia Manufacturing, 10 (2017):1020 – 1030.*
15. A. Angrish, **B. Starly**, X. Shen, Y.S. Lee, P. Cohen, “Scalable Linking of Slice Layer Information with Process Monitoring Data – A Case Study with Additive Manufacturing Machines”, *2016 Solid Freeform Fabrication Symposium, Austin, TX.*
16. Kumar, A., **Starly, B.**, “Modeling Human Mesenchymal Stem Cell Expansion in Vertical Wheel Bioreactors using Lactate Production Rate in Regenerative Medicine Biomanufacturing”, *2016 ASME MSEC Proceedings, Virginia-Tech, Blacksburg, VA.*
17. Ambati S., Raman, S., **Starly, B.**, “Quantitative Study on Image Based Material Identification Using Micro-Computed Tomography”, *Proceedings of NAMRI/SME, Vol 41, 2013.*
18. Rachel Dreher, Ryan Power, **Binil Starly**, "Biofabrication of Multi-Material Constructs Embedded with Patterned PC12 Neural Cell Lines”, *Proceedings of the ASME Bioengineering Conference, June 25-29th, 2013, OR, USA.*
19. Dilley, A., Krause E., Huang S., Raman, S., **Starly, B.**, “Virtual Reconstruction and Rapid Prototyping of a Juvenile Apatosaurus”, *SME RAPID Conference Proceedings, May 24-26th, Minneapolis, MN, 2011.*
20. L. Magwood, **B. Starly**, “Fabrication of Low Cost 1D CdSe Nanowires using Near-field Electrospinning”, *2010 Fall Meeting, MRS Proceedings, 2011 1302: mrsf10-1302-w09-14 (6 pages)*
21. Ozlem Yasar, Shih-Feng Lan, **Binil Starly**, “Dependence of Lindenmayer System (L-system) Parameters on Flow Characteristics in Engineered Biomaterials”, *2009 ASME World Congress, Nov 2009, FL, USA.*
22. Jayanthi Parthasarathy, **Binil Starly**, Shivakumar Raman, “Design of Patient Specific Porous Titanium Implants for Craniofacial Applications”, *RAPID 2008 Conference & Exposition Proceedings, May 2008, FL, USA – 2008 SME Dick Aubin Distinguished Paper award.*

INVITED PRESENTATIONS (10 RECENT):

1. “Building the Open Knowledge Network Graph with Product Design and Manufacturing Data”, Keynote talk, 3rd US Semantic Technology Symposium, Raleigh, NC., Mar 9-10th 2020
2. The nexus of manufacturing data powering design innovation, service marketplaces and intelligent machines”, **Invited Talk**, IISE Annual Research Conference, New Orleans, LA, May 22nd 2020.
3. “Manufacturing Knowledge Network”, Invited Talk, NIST Smart Manufacturing Group, Gaithersburg, MD, Feb 6th 2020
4. “AI in Manufacturing”, **Invited Talk**, AAAI Data in Manufacturing Symposium, Stanford, CA Mar 25-27th 2020.
5. “Democratizing Manufacturing via Geometric Deep Learning, Blockchain and Manufacturing-as-a-Service (MaaS) Platform”, **ASME IDETC-CIE Panel Invited Talk** at Computer Aided Product and Process Design Panel, Anaheim, CA 2019, Aug 18th 2019.
6. “The Age of Intelligent Machines: Bioreactors – Biofabrication - Blockchain”, **University of New Hampshire**, Department of Mechanical Engineering, April 23rd 2019.
7. “Manufacturing-as-a-Service platforms”, **Invited Talk, TechTextil North America, Raleigh, USA** Feb 28th 2019
8. “Decentralized Manufacturing Marketplaces via Blockchain”, Invited Talk, **HOUSTEX, Houston TX** Feb 26th-27th 2019.
9. “Digital Twin Technology in Manufacturing”, **NSF CPI PI Invited Talk, Washington DC**, Nov 16th 2018.
10. “Decentralized Manufacturing-as-a-Service Marketplace”, **Invited Plenary Talk, Solid Freeform Fabrication**, Austin, TX, Aug. 13-15th 2018.

FUNDED PROPOSALS

- | | | |
|----|---|---|
| 22 | RAISE: C-ACCEL: Open Knowledge Network Product Design and Manufacturing Graph-as-a-Service (Phase-I)
Agency: National Science Foundation
PI: Binil Starly (CoPIs – Daniel Panozzo – NYU and Shivakumar Raman – OU)
NC State CoPIs: Paul Cohen
Location: NC State, Raleigh, NC | 2019- 2020

\$900,000 |
| 21 | STTR: Enhanced Cybersecurity for Manufacturing
Agency: Department of Energy (Secmation Inc.)
PI: Binil Starly (CoPI – Rusty King, Ola Harrysson)
Location: NC State, Raleigh, NC | 2019 - 2020

\$60,000 |
| 20 | Real-Time Dielectric Spectroscopy of Scaffolds and Tissue Constructs

PI – Binil Starly (CoPI: Rohan Shirwaiker, Paul Cohen, Aditya Bhat (ABER Instruments)
Agency: Advanced Regenerative Manufacturing Institute (ARMI) | 2019-2020

\$365,000
NCSU Cost Match
(\$365,000)
\$730,000 |
| 19 | Planning Grant: Engineer Research Center: “Design by Anyone Build Anywhere” | 2018-2020 |

	Agency: National Science Foundation	\$99,999
	PI: Binil Starly, CoPI- Paul Cohen	
	Location: NC State, Raleigh, NC	
18	CSR: Medium: SmartChainDB - Enabling Smart Marketplaces With A Scalable Semantically-Enhanced Blockchain Platform	2018 - 2020
	Agency: National Science Foundation	\$499,999
	PI: Kemafor Ogan (CoPI: Binil Starly, Alessandra Scafuro)	
17	CESER: Pilot Manufacturing Cyberinfrastructure for Information Rich 3D Model Data	2018 - 2020
	Agency: National Science Foundation	
	PI: Binil Starly, CoPI- Yong Chen, Univ. of Southern California	\$299,999
	Location: NC State, Raleigh, NC	
16	I-Corps: A Platform for Matching Manufacturing Service Companies with Design Enterprises	2016 - 2017
	Agency: National Science Foundation	\$50,000
	PI: Binil Starly, CoPI: Wade Fulghum	
	Location: NC State, Raleigh, NC	
13	Streaming Machine Data from a Mill-Turn to the Digital Manufacturing Commons	2016 – 2017
	Agency: Digital Manufacturing Design Institute (Prime-DoD)	\$398,307
	PI: Binil Starly, CoPI: Yuan-Shin Lee, Paul Cohen	(50:50)
	Location: NC State, Raleigh, NC	(\$194,618)
12	Monitoring Quality of Bioprinted Constructs in Engineered Tissue Manufacturing.	2016-2019
	Agency: NSF (CMMI – Manufacturing & Machines)	\$302,083
	PI: Binil Starly (CoPI – Rohan Shirwaiker)	
	Location: NC State, Raleigh, NC	
11	Cybermanufacturing: Just-In-Time Compilation of Product Manufacturing Data to Machine Instructions via an Industrial Machine Operating System	2015-2018
	Agency: NSF (CMMI – Engineering Interdisciplinary Research)	\$319,752
	PI: Binil Starly (CoPI – Yuan-Shin Lee, Paul Cohen, Xipeng Shen)	
	Location: NC State, Raleigh, NC	
9	Mobilizing New England Vascular Plant Specimen Data to Track Environmental Changes: - High Throughput Digitization Platform of Herbarium Specimens”	2012 – 2016
	Agency: Subcontract from Yale University (Prime – NSF, \$2.37M)	\$226,879
	PI: Binil Starly (Yale University, PI: Patrick Sweeney)	
	Location: NC State, Raleigh, NC	
8	“NSF CAREER: Bio-Manufacturing Heterogeneous Multi-scale 3D Matrices for Engineering Living Tissue Systems”	2009-2015
	Agency: NSF(CMMI-Manufacturing and Machines)	\$400,000
	PI: Binil Starly	

Location: NC State, Raleigh, NC

- | | | |
|---|---|----------------------------|
| 7 | “MRI: Acquisition of a Fluorescence Activated Cell Sorter (FACS)”
<i>Agency:</i> NSF (MRI Program)
CoPI: Binil Starly (University of Oklahoma, PI: David Schmidtke)
Location: University of Oklahoma, Norman | 2012 – 2014
\$394,343 |
| 6 | Development of Adult Stem Cell Characterization Facilities”, Oklahoma Center for Adult Stem Cell Research
<i>Agency:</i> Oklahoma Center for Advanced Science and Technology (OCAST)
CoPI: Binil Starly (University of Oklahoma, PI: David Schmidtke)
Location: University of Oklahoma, Norman | 2011 – 2013
\$155,497 |
| 5 | “Application of Single-Walled Carbon Nanotubes”
<i>Agency:</i> US Dept. of Energy
CoPI (University of Oklahoma, PI: Daniel Resasco)
Location: University of Oklahoma, Norman | 2010 – 2013
\$972,000 |
| 4 | “Shape Engineering towards Advanced Manufacturing”,
<i>Agency:</i> Oklahoma Center for Advanced Science and Technology (OCAST)
CoPI: Binil Starly (University of Oklahoma, PI: Shivakumar Raman)
Location: University of Oklahoma, Norman | 2009 - 2012
\$3,000,000 |
| 3 | “Role of Design Geometry on Metabolic Clearance Rates for Liver Tissue Model Systems”
<i>Agency:</i> Oklahoma Center for Science and Technology (OCAST)
PI: Binil Starly
Location: University of Oklahoma, Norman | 2007 - 2010
\$127,000 |
| 2 | "REU Site: Sensors and Metrology for Manufacturing and Newer Enterprises",
<i>Agency:</i> National Science Foundation (NSF)
CoPI: Binil Starly (University of Oklahoma, PI: Shivakumar Raman)
Location: University of Oklahoma, Norman | 2007 - 2010
\$300,000 |
| 1 | "GAANN: Promoting Versatility in Doctoral Bioengineering Education."
<i>Agency:</i> US Department of Education
CoPI: Binil Starly (University of Oklahoma, PI: Ed O’Rear)
Location: University of Oklahoma, Norman | 2008 - 2011
\$511,524 |

Research \$ Directly Responsible (as PI or CoPI share): \$6.0M

Total Research \$ Awarded (as PI or CoPI): ~\$10.00M

PATENTS & LICENSES

- “Manufacturing 3D Search”, Software License to Fabwave Labs, LLC. 11/14/2018
- “Bioprinting 3D structures onto microscale tissue analog devices for pharmacokinetic study and other uses”, US Patent#

8,343,740, Published 2nd May 2013.

- “Tubeless Bioreactors for Cell Expansion in Cell Therapy and Regenerative Medicine Manufacturing”, disclosed Oct 30th, 2017, #18088
- “Method and System for Identifying, Matching and Ranking Prospective Graduate Students for University Programs”, Disclosed Oct 2013 to NCSU Intellectual Property Office. #14073.

PROFESSIONAL ACTIVITIES

Professional Society Memberships

- Institute of Industrial Engineers (IIE)
- Society of Manufacturing Engineers (SME)
- American Society of Mechanical Engineers (ASME)

Professional Service

- Department Editor, IISE Transactions Design & Manufacturing Division, Aug 2018 – present
- Editorial Board Member: Journal of Biofabrication (2013-present)
- Research Paper Reviewer for 17 Journals: Journals of American Institute of Chemical Engineers (AIChE) Proceedings, PLoS ONE, Biofabrication, Biomaterials, Rapid Prototyping, ASME Nanotechnology, ASME Manufacturing Science, ASME J. of Medical Devices, Rapid Prototyping Journal, Microfluidics and Nanofluidics, Trends in Biotechnology, Journal of Biomedical Materials Research - Part A&B, Experimental Techniques, Acta Biomaterialia, IEEE Human Systems Engineering, Computer Aided Design, Journal of Membrane Science and American Society for Artificial Internal Organs (ASAIO).

PUBLIC MEDIA ON STARLY’S WORK

- “The 20 Most Influential Professors in Smart Manufacturing”, <https://www.sme.org/technologies/articles/2020/june/the-20-most-influential-professors/> , June 2020 **Smart Manufacturing Magazine**.
- “Meet the Blockchain for building better widgets, cheaper and faster”, **MIT Tech Review** Article, May 3rd 2018. <https://www.technologyreview.com/s/611074/meet-the-blockchain-for-building-better-widgets-cheaper-and-faster/> . Also appeared in IISE Magazine - Frontline, NSF News from Field, NCSU Research Office.
- Process development work featured in on-line version of **IISE journal**, “Prehistoric Reverse Engineering Brings Dinosaur Bones To Life”. <http://www.iienet2.org/details.aspx?id=20994>. This work was also featured in the Smithsonian Magazine, Oct 2011, “A Juvenile Apatosaurus Makes its Debut”, <http://www.smithsonianmag.com/science-nature/a-juvenile-apatosaurus-makes-its-debut-101379607/?no-ist>
- Research work mentioned in local TV channel – WRAL Morning News, <http://www.wral.com/wral-tv/video/13646945/>. Morning TV Host Bill Leslie talks with Binil Starly on Printed Engineered Tissue., May 15th 2014.