

NDSU NORTH DAKOTA STATE UNIVERSITY



DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

ANNUAL REPORT
2019-2020



A MESSAGE FROM THE CHAIR

Last fall and early winter classes were running smoothly and life was fairly uneventful. Faculty were busy writing grants and several faculty received awards. Dr. Lokesh Narayanan and Dr. Val Marinov were nominated into the local National Academy of Inventors (NAI), and I was nominated as a Fellow in the NAI. Dr. Tim Trung has established a fully functional sleep laboratory, Nita Yodo has been busy submitting grants to commodity boards on TEA of sustainable materials and Om Yadav is collaborating on an NSF grant focused on International Research Experience for Students. Dr. Yiwen Xu, as Graduate Student Coordinator, has been concentrating on meeting all of the needs of the graduate students in spite of the many challenges posed by immigration regulations. Led by Dr. Kambiz Farahmand, we are preparing for the next ABET accreditation cycle with all new measures.



Over the last year, we have been able to stabilize student enrollment despite a campus-wide reduction in overall enrollment. If we can say the same thing next year, we will have done the impossible as COVID-19 has greatly affected higher education enrollment nationwide. However, we take on this challenge and continue to work with high schools, organizations, and communities to recruit the best and brightest students.

Once the recent pandemic showed up on the Nation's doorstep around the Holidays, NDSU had to pivot to online teaching after spring break. Because we have a long, proud history being a face-to-face institution, this presented a challenge for everyone: students, faculty, and staff. Students left campus for spring break expecting to return to campus a week later, only to learn that it would be necessary to move out of the dorms and the last two months of classes would be on-line. The offices were closed and we all became experts in ZOOM, TEAMS, SLACK, and other applications we had never heard of. During my senior exit interviews (via ZOOM), I was happy to hear students report back that the IME faculty and staff did a great job in quickly switching to a virtual classroom environment. In spite of the fact that many of the senior capstone project sponsors had to stop company visits, the students, faculty (Dennis Steinman), and sponsors all adapted to virtual meetings and visits. Much of our successful transition has been possible due to Beth Dahl's hard work and passion for the department making sure all of the necessary systems run smoothly and the never-ending processing of paperwork is completed. Ben Deetz also did a great job in organizing CB²'s first Industrial Advisory Board meeting through ZOOM that even included social events.

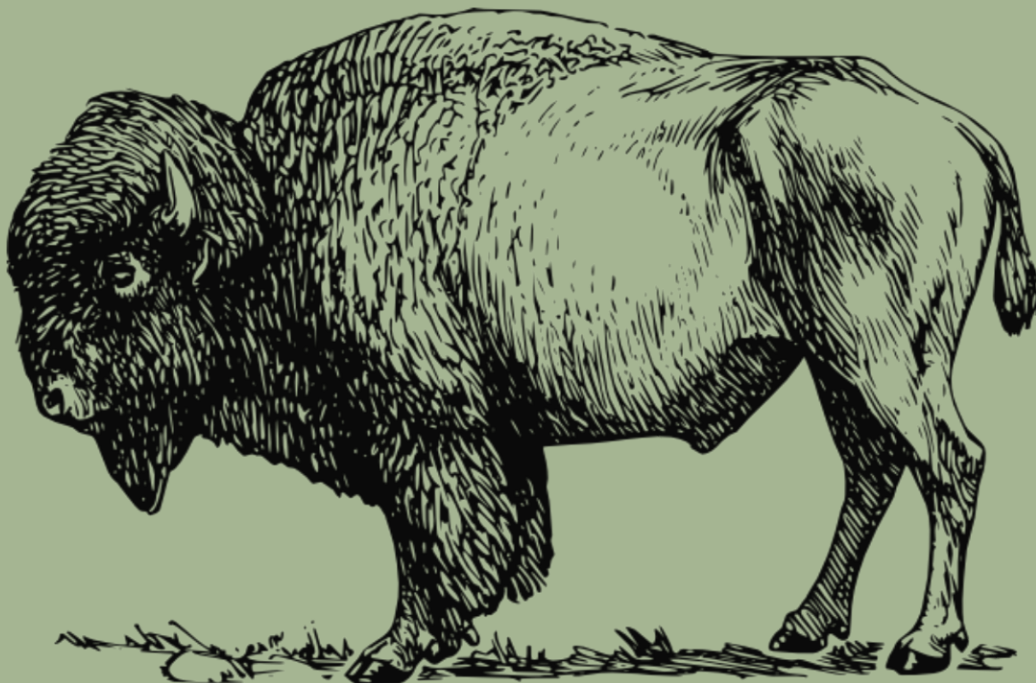
As we start a new academic year, with many unknowns, I am more than confident that students, staff, and the IME faculty will be able and willing to take on any challenges that they are faced with. While social distancing is not in our nature, we have found ways to stay safe and still stay connected. Over the summer, we had weekly "what's up Wednesdays" to keep everyone informed and engaged through virtual meetings. Over the fall semester, we will be building on what we have already learned and enhance student learning as well as meeting student expectations. While we can expect some twists and turns in the road ahead, I am sure the BISON spirit and strength will allow all of us to rise to the occasion.

A handwritten signature in cursive script that reads "David Grewell". The ink is dark and the signature is fluid and legible.

David Grewell
Professor/Department Chair/CB² Center Director

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DEPARTMENTAL BUDGET

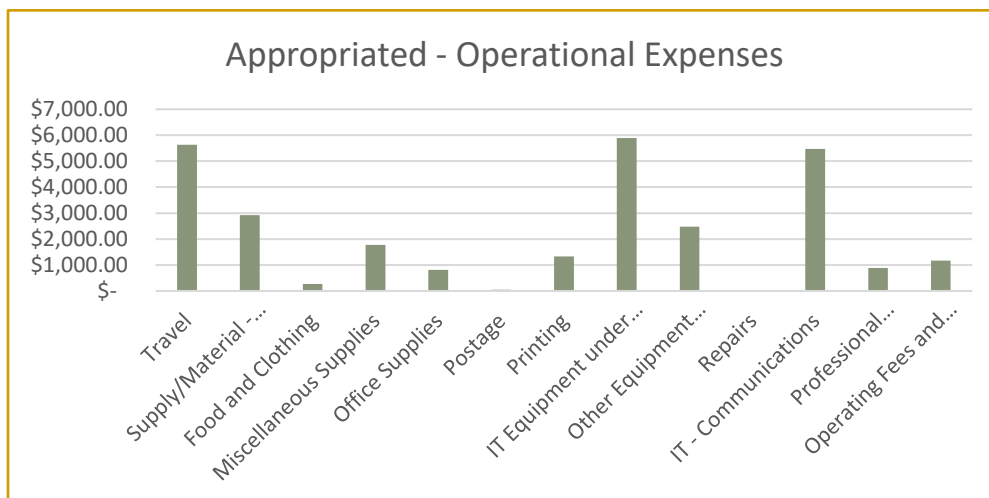
Financial Report as of June 30, 2020

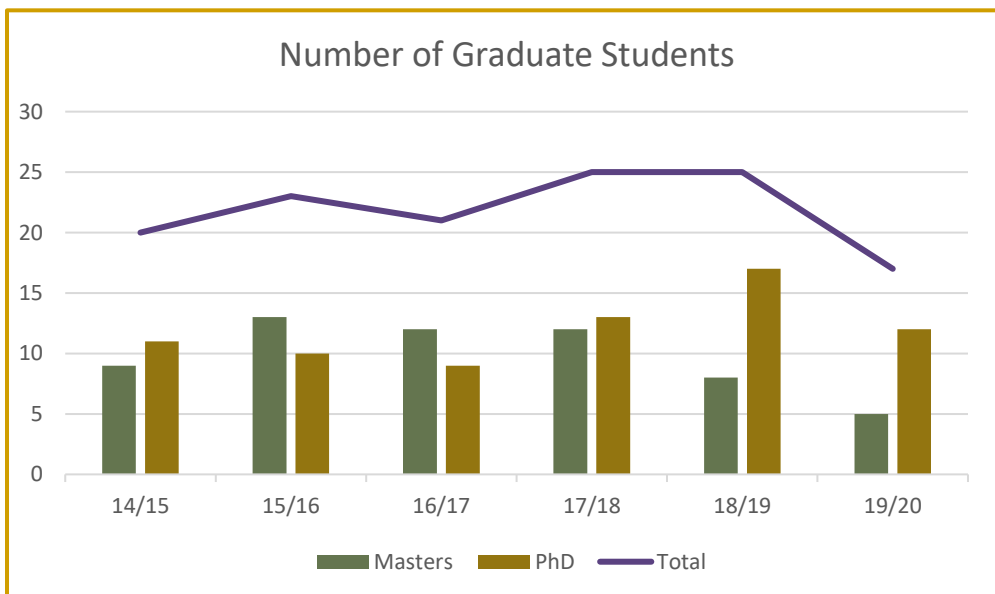
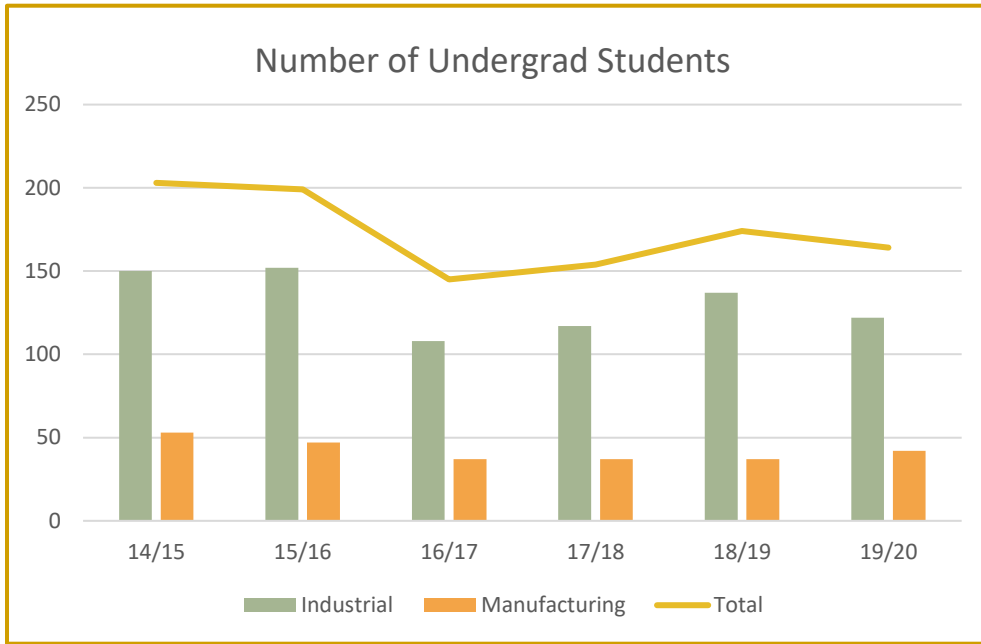
PS Fund	Title	Beginning Balance as of 7/1/2019	YTD Revenue	YTD Expense	Ending Balance as of 6/30/2020
30134	Appropriated - Operations	\$ 45,085.00		\$45,083.01	\$ 1.99
30312	Differential Tuition - Operations	\$ 23,246.38		\$7,898.84	\$ 28,161.19
30540	Provost fund in lieu of lab fees	\$ 9,416.00		\$9,194.30	\$ 221.70
30922	Summer School allocations	\$ 2,442.65	\$3,800.00	\$1,343.21	\$ 4,899.44
18052	IME General Fund	\$ 25,026.81	\$28,884.45	\$908.79	\$ 53,002.47
18337	Indirects	\$ 50,323.16	\$6,129.13	\$17,470.30	\$ 38,981.99
18428	Capstone	\$ 42,345.82	\$0.00	\$10,035.84	\$ 32,309.98
18837	CB ² - Grewell & Dean	\$ 887.50	\$0.00	\$817.77	\$ 69.73
19173	IME QRME - Yadav	\$ 84,505.25	\$20,000.00	\$25,547.96	\$ 78,957.29
Total Appropriated and Local Funds:		\$283,278.57	\$58,813.58	\$118,300.02	\$236,605.78

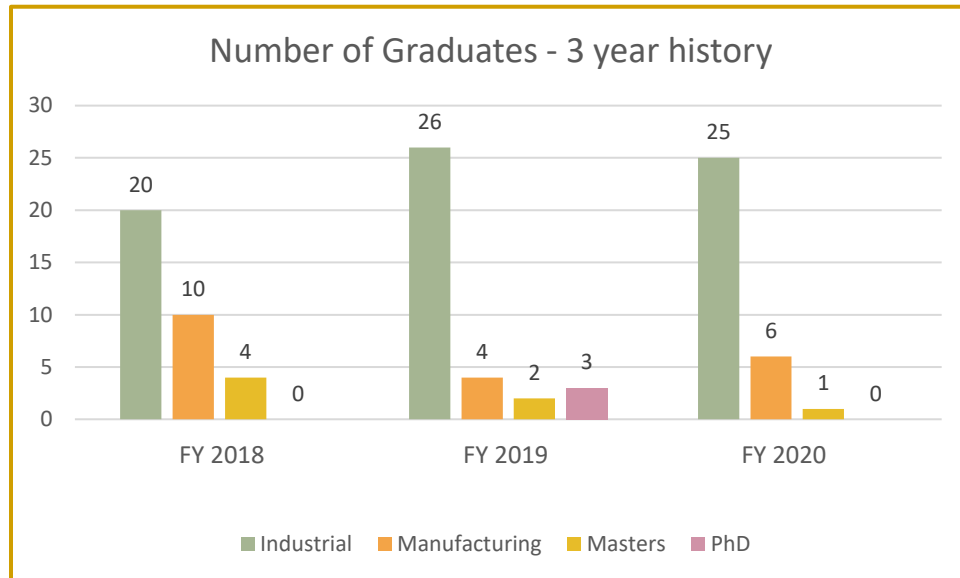
Includes remaining salary amount of \$12,813.65

PS Fund	Title	Beginning Balance	YTD Revenue	YTD Expenses	Total Balance Available
22110	Machine Shop - Chuck	\$23,395.29	\$0.00	\$8,188.84	\$ 15,206.45
22183	Re-Charge Center	\$0.00	\$11,517.53	\$11,550.53	\$ (33.00)
Recharge Center					
PS Fund	Title	Beginning Balance	YTD Revenue	YTD Expenses	Total Balance Available
79787	Marvin Windows (restricted for student use)	\$ 22,410.50	\$5,000.00	\$3,550.75	\$ 23,859.75
Total Restricted Gift Funds:		\$22,410.50	\$5,000.00	\$3,550.75	\$23,859.75

30081	IME Department Fund	\$43,604.47	\$6,215.00	\$710.75	\$ 49,108.72
30143	Robotics & Control Lab	\$2,437.20	\$0.00	\$0.00	\$ 2,437.20
30144	IME Labs	\$6,113.79	\$0.00	\$0.00	\$ 6,113.79
30216	IME Scholars Fund	\$0.00	\$0.00	\$0.00	\$ -
30437	CQRME	\$24.19	\$0.00	\$0.00	\$ 24.19
30491	Heller, Robert & Diane CQRME Fund	\$95,095.00	\$0.00	\$0.00	\$ 95,095.00
30512	Vettel Family IME Fellowship	\$30,000.00	\$31,578.95	\$1,578.95	\$ 60,000.00
40135	Vettel, IME Department Endowment Fund	\$3,085.00	\$772.00	\$0.00	\$ 3,857.00
Total Spendable IME Foundation Funds as of 6/30/2020		\$180,359.65	\$38,565.95	\$2,289.70	\$216,635.90
Total FY20 Revenue/Expenditures		\$509,444.01	\$113,897.06	\$143,879.84	\$492,274.88







NAME	DEGREE YEAR	TITLE	DEGREE TYPE
SUNNY MARE	2020	Experimental Study of the Temperature Profile of a Gaussian Type Heat Distribution	M.S.



Ring Ceremony

Recent students who took part in the “Order of the Engineer” fall ring ceremony giving their “Horns Up” with their newly acquired rings!

2020 SENIOR CAPSTONE PROJECTS

Company	Project	Students
Action Fabrication	Manufacturing Equipment Evaluation & Utilization Analysis	Alex Blake, Jacob Gerdes, Sean Noel, and Dillon Radunz
Border States Electric	Transportation Equipment Utilization Model	Joshua Larson, David Shea, and Ryan Larson
BTD Manufacturing	Process & Productivity Improvement Study	Samantha Killmer, Dustin Stedman, and Nick Johnson
Com Del Innov./ Heartland Precision	Productivity/Workflow Improvement Analysis	Darby Beyer, Thomas Sprengeler, and Jacob Tweten
Doosan Bobcat	Efficiency & Flow Improvement analysis of the Manifold Assembly Line	Justin Ebnet, Jared Jukich, and Jacob Simicik
FAST Manufacturing	Test Work Station Design for Wire Harness Assembly Process	Sam Hampton, Chris Swedzinski, Steven Taylor, and Tyler Wanzek
Felling Trailers	Assembly Line Analysis for Warehousing, Delivery, & Inventory	Carli Carrier, Loai Alkhamis, Michael Moralez, and Elena Pearce
Horton	Spun Metal Pulley Process Improvement Analysis	Sam Abrahamson, Cory Hodgin, Nicholas Theis, and Mathew Schiroo
Massman Automation	Raw Material Flow Process Mapping & Improvement Analysis	Brianna Connor, Mitchell Cramer, Tyler Larson, and Rose McNamee
Rite Screen	Manufacturing & Assembly Cell Optimization Analysis	Dani Filipi, Andrew Liu, and Trevor Walderon



1st Place

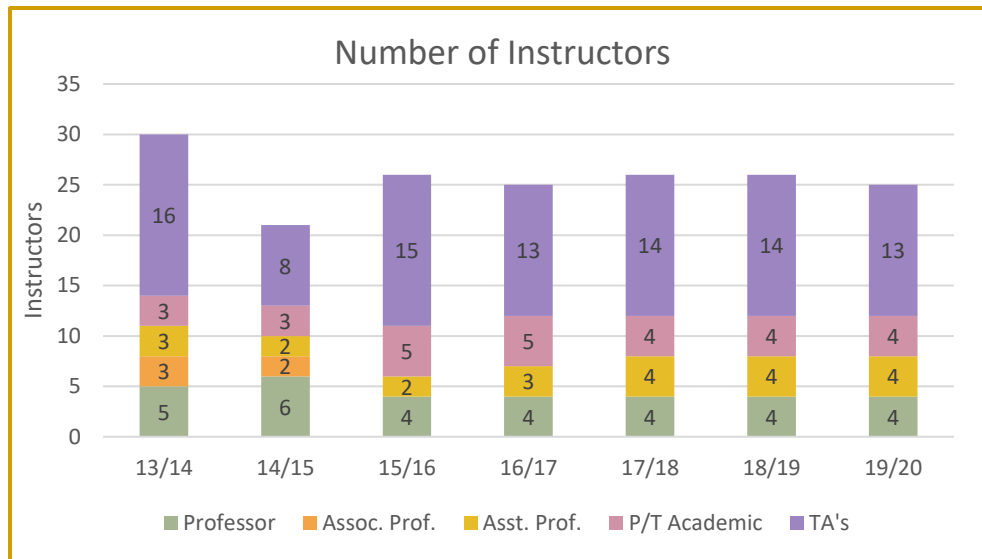


2nd Place



3rd Place – Tie





Staff	
Charles Choate	Laboratory Supervisor/Instructor
Beth Dahl	Assistant to Department Chair
Ben Deetz	Business Develop. Coord. (CB ²)
Armon Myrick	Laboratory Supervisor/Instructor

Part-time Academic – Courses Taught	
Maisha Asha	IME 440; Engr. Economy
Jim Misialek	IME 456; Project Mgmt.
Clint Rossland	IME 111; Intro to IME
Dennis Steinman	IME 489; Senior Capstone

Faculty	
David Grewell	Department Chair, Professor
Canan Bilen-Green	Vice Provost of Faculty Affairs, Professor
Kambiz Farahmand	Professor
Trung (Tim) Le	Assistant Professor
Val Marinov	Professor
Lokesh Narayanan	Assistant Professor
Yiwen Xu	Assistant Professor
Om Prakash Yadav	Professor
Nita Yodo	Assistant Professor

FACULTY STATISTICS (2019 Calendar Year)

Faculty Statistics for Calendar Year 2019		Total
Scholarly Activities		
Peer reviewed journal papers appearing in print this calendar year		21
Journal papers in review		19
Conference papers appearing in print		14
Books appearing in print		4
Patents issued		0
Annual research reports completed and submitted		7
Plenary, invited or keynote lectures given		7
Conference Leadership roles		11
Total:		83
Teaching and Advising		
Direct Instruction		17
PhD students supervised		19
PhD as a committee member		21
MS students supervised		9
MS as a committee member		15
Undergraduate students advised		150
Student Organization advising		7
Total:		238

Proposals 1/1/2015 - 12/31/2019			Awards 1/1/2015 - 12/31/2019		
Row Labels	Total Budget	Count of Proposal	Row Labels	Sum of Awarded Amount	Count of Contract
⊕ 2015	\$2,304,529.00	18	⊕ 2015	\$208,865.00	7
⊕ 2016	\$1,848,274.00	17	⊕ 2016	\$116,375.00	5
⊕ 2017	\$1,845,476.00	13	⊕ 2017	\$184,375.00	6
⊕ 2018	\$3,354,043.00	13	⊕ 2018	\$30,000.00	1
⊕ 2019	\$6,897,807.00	14	⊕ 2019	\$102,420.00	3
Grand Total	\$16,250,129.00	75	Grand Total	\$642,035.00	22

AWARDS

Dr. Lokesh Narayanan Awarded Vettel Family IME Fellowship

Dr. Lokesh Narayanan, assistant professor, became the first recipient of the newly-established IME Vettel Family Fellowship which was established by Matthew and Jenna Vettel. Fellowships are awarded to accomplished NDSU scholars to advance research, education, and outreach. The ceremony for Dr. Narayanan was held on November 14th in the NDSU McGovern Alumni Center.



Dr. Val Marinov & Dr. Lokesh Narayanan Inaugurated into the NDSU Chapter of National Academy of Inventors

The National Academy of Inventors (NAI) is a member organization comprised of U.S. and international universities, and governmental and non-profit research institutes, with more than 4,000 individual inventor members and fellows from over 250 institutions worldwide. It was founded in 2010 to recognize and encourage inventors with patents issued from the United States Patent and Trademark Office. They strive to enhance the visibility of academic technology and innovation, encourage the disclosure of intellectual property, educate and mentor students, and translate the inventions of its members to benefit society.



Dr. David Grewell Named Fellow of National Academy of Inventors

The NAI Fellows Program highlights academic inventors who have demonstrated innovation in creating or facilitating inventions that have made an impact on the quality of life, economic development and the welfare of society. The honor is considered the highest professional distinction accorded solely to academic inventors. Dr. Grewell's portfolio includes 15 U.S. patents. Formal recognition at the NAI Fellows Induction Ceremony, has been rescheduled for April 10, 2021 due to COVID-19.

Dr. Spencer Duin and the late Dr. David Wells Awarded the IME Recognition of Excellence Award

Spencer Duin graduated from NDSU with a BS in Industrial Engineering in 1965. Spencer has served the department and NDSU continuously by financially supporting NDSU advancements while also generously giving his time and expertise.

Dr. Wells joined the Industrial and Manufacturing Engineering Department at NDSU in 2000 to pursue his love of teaching. He led the department for a number of years and continued as professor for 17 years. Dr. Wells had a unique ability to connect with his students. This connection helped light the path for many students' careers and defines his significant contributions to the IME Department.



RESEARCH FOCUS AREAS

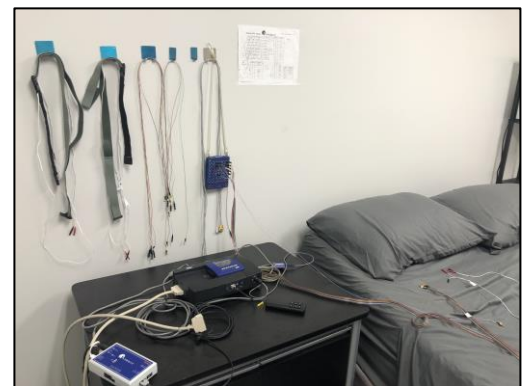
SPACHES (Sensing and Predictive Analytics for Computation Health System Sleep Lab



One of the most challenging fields in medicine is the prediction and prevention of diseases and health conditions. “Big data” analytics and advanced biosensors are being engineering to help proactively prevent disease and promote over-all health and wellness. We see a lot of these trends in wearable monitoring systems, such as Apple watches or Fitbits. They integrate advanced data analytic methods and other devices that help to support physicians and provide better diagnosis and treatment. The SPACHES lab is equipped for these “big data” research areas.

Currently, Dr. Le is researching the diagnosis and treatment of sleep disorders in a three step sequence: (1) Point-of-care devices for bio-signal monitoring and diagnosis of sleep disorders (2) Predictive analytics methods for real-time and personalized diagnosis and prediction of impending Obstructive Sleep Apnea, and (3) Preventive treatment and intervention of Obstructive Sleep Apnea.

Principal Investigator	Trung (Tim) Q. Le
Graduate Students	Phat Huynh & Quoc Nguyen (Ph.D. Students)
Undergraduate Students	Quang Dang and Drew Grondahl



RESEARCH FOCUS AREAS

ENGINEERED TISSUE MANUFACTURING LAB

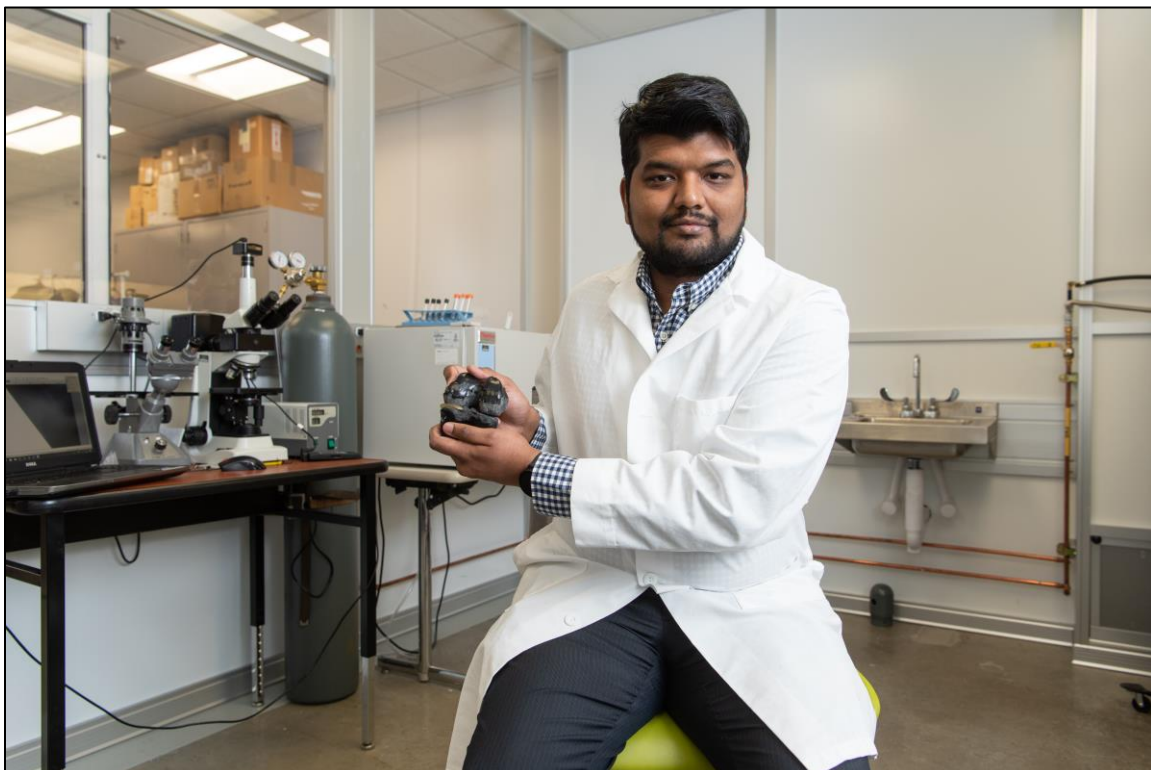
Focus: Fabrication of tissue models and scale-up of engineered tissue manufacturing – to make engineered tissue accessible to public.

Engineered tissues created using living cells and biomaterials via processes such as 3D bioprinting have the potential to serve as functional tissue substitutes, in lieu of traditional inert medical implants, for treatment of injuries and diseases.

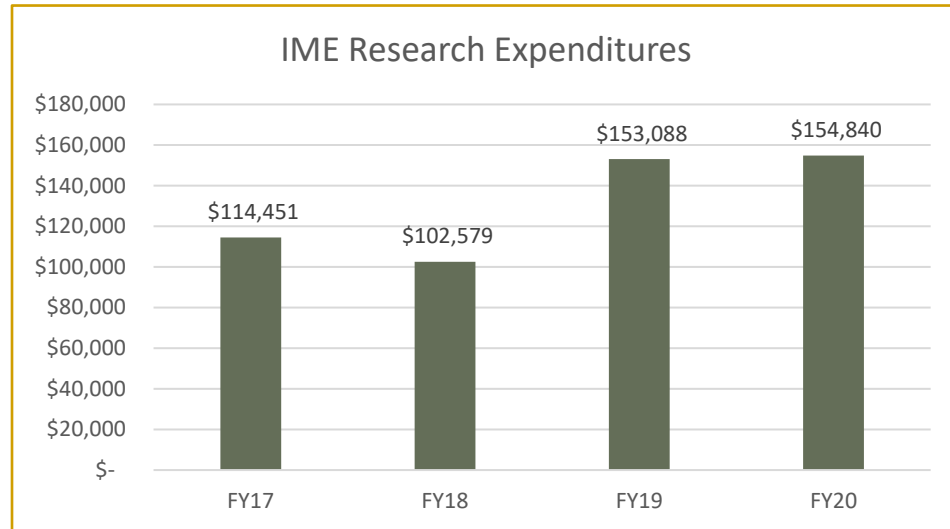
Most technologies have currently been demonstrated at the laboratory scale, and the methods used for quality monitoring are often destructive in nature. To enable their manufacturing scale up, it is imperative to complement core biomaterial and 3D bio printing technologies with efforts in systems and quality engineering.



Principal Investigator	Lokesh Narayanan
Graduate Students	Raihan Quader (PhD student)
Undergraduate Students	Triston Ihrke



RESEARCH OVERVIEW



PS FUND Nbr	PS PROJECT	PI	Fund Title	Open Date	Close Date	Direct Cost	F&A	Total
43500	FAR0024544	Yadav	CQRME Horton Holding	2015/01/01	2020/12/31	\$51,725.00	\$23,275.00	\$75,000.00
43500	FAR0024545	Yadav	CQRME Bobcat	2015/01/01	2020/12/31	\$51,725.00	\$23,275.00	\$75,000.00
43700	FAR0030164	Khoda	EPSCoR Y5	2018/08/01	2019/07/31	\$72,783.00	\$32,752.35	\$105,535.35
46000	FAR0030661	Grewell	Biodegradable Mulch for Specialty Crop	2019/07/01	2020/12/31	\$37,420.00	\$0.00	\$37,420.00
46000	FAR0030821	Grewell	IUCRC - CB ² Phase 1	2019/05/15	2021/04/30	\$103,448.00	\$46,552.00	\$150,000.00
46000	FAR0031033	Le	Point of Care (OSA) Monitoring & Forec	2019/09/01	2020/08/31	\$14,416.00	\$6,487.00	\$20,903.00
46000	FAR0031593	Grewell	IUCRC/UIDP ISU Fund Relocation	2019/10/01	2020/10/31	\$7,936.00	\$3,571.00	\$11,507.00
46200	FAR0031748	Narayanan	LEV: Faculty startup(Narayanan)	2019/07/01	2021/06/30	\$69,853.46	\$0.00	\$69,853.46
46200	FAR0031757	Narayanan	LEV: Faculty startup(Narayanan)	2019/07/01	2020/12/31	\$5,146.54	\$0.00	\$5,146.54
46200	FAR0032090	Yodo	ND EPSCoR - CI: Preliminary Data	2019/09/30	2020/12/15	\$10,000.00	\$0.00	\$10,000.00
46200	FAR0032233	Le	ND EPSCoR - SO: Prelim Data	2019/10/15	2020/12/15	\$4,944.00	\$0.00	\$4,944.00
48500	FAR0032338	Le	Sub: Sanford	2019/09/01	2020/08/31	\$3,907.00	\$1,757.00	\$5,664.00
46000	FAR0032577	okesh/Grewell	Moisture sensitivity of PLA/PBS blends	2020/01/01	2020/12/31	\$16,000.00	\$0.00	\$16,000.00
46000	FAR0031904	Yadav	IRES: Int'l Research Exp for Students	2020/04/01	2023/03/31	\$51,914.00	\$23,362.00	\$75,276.00
48500	FAR0033064	Yadav	Participant Support: IRES	2020/04/01	2023/03/31	\$52,800.00	\$0.00	\$52,800.00

James D. & Roselyn K. Aipperspach Scholarship Endowment

- Megan LaLonde, Saint Cloud, MN
- Mitchell Rogers, Forest Lake MN

Frank E. Biltonen Scholarship

- Betsy Surver, Long Lake, MN

Gordon Heller Scholarship

- Darby Beyer, Chokio, MN
- Will Odland, Alexandria, MN

IME Chair's Scholarship

- Parker Bussinger, West Fargo, ND

Industrial and Manufacturing Engineering Scholarship

- David Hoffman, Fargo, ND

Val and Milena Marinov Scholarship

- Ethan Olson, Moorhead, MN

Paul and Sharon Madson Industrial Engineering Scholarship

- Megan Chromy, Callaway, MN
- Abdirizak Abdikadir, Fargo, ND
- McCoy Van Klompenburg, Willmar, MN
- Jordan Kellen, Clinton, MN
- Kaija Rizzo, Eau Claire, WI
- Stephon Wilder, Saint Paul, MN

Philip W. Ruud Scholarship

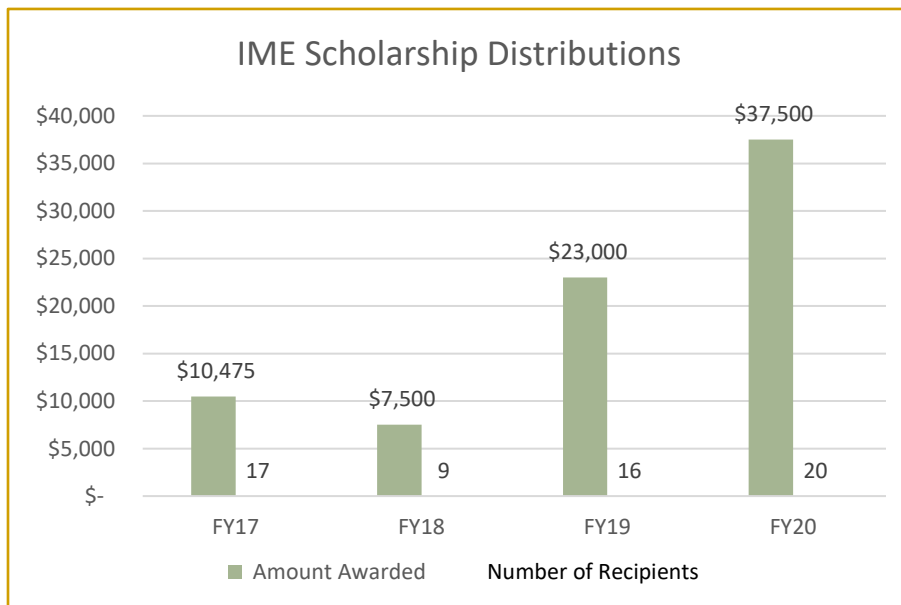
- David Hoffman, Fargo, ND

Vareberg Family Engineering Scholarship

- Emma Culshaw, Willmar MN

Vettel Family IME Scholarship

- Emily Runsvold, Fargo, ND
- Miranda Salmon, Bismarck, ND
- Parker Bussinger, West Fargo, ND
- Benjamin Olson, Golden Valley, MN



ADVISORY BOARD

NAME	JOB TITLE	COMPANY
JASON ADAM	Project Manager	NASA
SCOTT BADER	Senior product engineer	Teel Plastics, Inc.
CHRIS BARTA	Director of operations	Tecton Products, LLC
RAY BERRY	President and CEO	OmniByte Technology
JAMES ENGELSTAD	Project Manager, Supply Chain	Sanford Health
JODY FEMRITE	Industrial Engineer	Sparton Corp
ADITYA GARG	Plant Manager	CNH Industrial
JOHN HANSMANN	Vice President, Professional Services	Health Catalyst
KIM HEINLE NELSON	Senior Manager, Operational Excellence	Digi-Key Electronics
ROBERT HELLER	President	Heller Capital, Inc.
AL HENDERSON	Brigadier General	Retired
VERDALE HERMAN	Manufacturing Scheduler	CNH Industrial America LLC
DAN HOEFS	President	Padgett Business Services
DEREK HOLT	CT Business Analyst	Doosan Bobcat
BRIAN JOHNSON	Vice President of Operations	Marvin Companies
MICHAEL KIERNAN	Retired	Case New Holland (CNH)
DAVID N. LONG	Retired	SJE-Rhombus
DAVID S. LONG	Principal Systems Engineer Professor of Systems Engineering	CENTUARI University of Dayton
PAUL MADSON	Retired	Border States Electric
DAVID MALM	Retired	
MICHAEL MATHERS	Sourcing Specialist Sr.	Doosan Bobcat North America
TODD MEESTER	Regional Sales Director	Datalink
JIM MISIALEK	Project Manager	Marvin Companies
BRIAN POPOFF	Principal	Capgemini Consulting
CLINT ROSSLAND	Health Systems Engineer	Sanford Health
MICHAEL SCHNEPF	Data Analytics Manager	Border States Electric
PETER SEDGEMAN	Director	Social Services of Polk, County, MN
DENNIS STEINMAN	General Manager	SuperValu
CHRISTY STRONG	Director	Global Enterprise-Boston Scientific
EMMY VAREBERG	Vice President	Vareberg Engineering, Ltd.
BRETT WINKELMAN	President	Fargo Assembly Co.

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A Great Big **THANK YOU** to ALL of our Donors!

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Thank You!

We are very grateful for the support of our generous alumni, faculty, staff and friends.

Your Donation Helps...

- Fund student scholarships
- Support student clubs and activities
- Support research/education through laboratory and classroom improvements
- Support faculty through endowed chairs and professorships

Ways to Contribute:

- Contact one of the Directors of Development for the College of Engineering:
 - Andy Dahl: andy@ndsualumni.com or PH: 701.934.0856
 - Lisa Otterson: Lisa.otterson@ndsualumni.com or 701.561.8591
- Online gifts can be made at the NDSU Development Foundation: <https://www.ndsualumni.com/contribute>
- NDSU Giving Day, December 3rd, 2019; <https://www.ndsugivingday.com>



The Herd

*Now this is the law of the prairie
 As old and as true as the sky
 And the Bison that keep it will prosper
 And the Bison that break it will die
 As the creeper that girdles
 the tree trunk
 This law is the final word:
**For the strength of the Herd
 is the Bison
 And the strength of the Bison
 is the Herd.***



NDSU

INDUSTRIAL AND MANUFACTURING ENGINEERING

**Industrial and Manufacturing Engineering Department
North Dakota State University
1410 14th Avenue North
Civil & Industrial Engineering Bldg, Room 202
Fargo, ND 58102**

**701-231-9818
www.ndsu.edu/ime**

