

Processional

National Anthem

Christine Kavanagh
Associate Vice Dean for Graduate Education and Lifelong Learning
G.W.C. Whiting School of Engineering

Welcome

Stephen Gange
Interim Provost and Senior Vice President for Academic Affairs
The Johns Hopkins University

Dean's Remarks

T. E. Schlesinger
Benjamin T. Rome Dean
G.W.C. Whiting School of Engineering

Keynote Address

Jun Wu MS '98, PhD '03
Founding Partner, Amino Capital
Adjunct Professor, Shanghai Jiaotong University

Address to the Graduates

Sabine Stanley
Vice Provost for Graduate and Professional Education
Bloomberg Distinguished Professor
The Johns Hopkins University

Remarks on Behalf of the Graduate Representative Organization

Ali Hasan Siddiqui
Department of Earth and Planetary Sciences, Krieger School of Arts and Sciences
Michael Gregory Tsimmerman Wilkinson
Department of Mechanical Engineering, Whiting School of Engineering
Doctoral Candidates and Co-Chairs of the Graduate Representative Organization

Hooding of Graduates

Sridevi V. Sarma
Vice Dean for Graduate Education and Lifelong Learning
Associate Professor of Biomedical Engineering
Associate Director, Institute for Computational Medicine
G.W.C. Whiting School of Engineering

Greetings from the Alumni Association

Judy Keen MS '98 (A&S), PhD '02 (BSPH), PDF '04 (Med)
First Vice President, Johns Hopkins Alumni Association

Closing

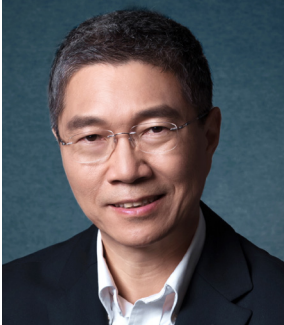
T. E. Schlesinger

Recessional

Graduates are asked to remain in their seats until they are dismissed from their row.
A final graduation certification may not have been conferred before this program was printed.
The list of candidates is tentative. The university reserves the right to withdraw or add names.

KEYNOTE SPEAKER

JUN WU



Jun Wu is a founding partner of Amino Capital, an adjunct professor at Shanghai Jiaotong University, a former senior staff research scientist at Google, a former vice president at Tencent Technologies, and a board member of five public and private companies.

A renowned expert in artificial intelligence, natural language processing, and web search, Wu began his career at Google as a software engineer, and subsequently as a research scientist, in 2002. Shortly after joining, Wu received the Google Engineering Award for his accomplishments in web search anti-spam. He was the original author of Google's Chinese/Japanese/Korean search algorithms; the inventor of many Google technologies using natural language processing; and was highly praised by Eric Schmidt and Sergey Brin for his

contributions to the company. He co-founded the engineering departments of APAC, which evolved into the Google offices in China, Japan, and Korea.

Wu joined Tencent Technologies as the VP in charge of search, infrastructure, maps, and search ads from 2010 to 2012. In only two years, he helped boost the company's search traffic and revenue by six-fold. Wu rejoined Google in 2012 and initiated efforts in smart search and automatic question/answering. In 2014, he left Google to co-found Amino Capital, where he invested in about 300 startup companies, including Zoom, Grail, Meituan, Kuaishou, Weee, and Dfinity.

Wu is a member of the advisory board of the Whiting School of Engineering at Johns Hopkins University, and he has given back to the school in many ways since his graduation. He has authored many award-winning books, inspiring many young people to participate in the IT industry. He has also published more than 10 papers in journals and conferences and was granted about 20 patents in the U.S. and internationally.

Wu obtained his master's and doctoral degrees in computer science from Johns Hopkins University and his bachelor's degree from Tsinghua University.

DEPARTMENT OF APPLIED MATHEMATICS AND STATISTICS

- JOSHUA AGTERBERG (2023) Advisor: Carey Priebe (Hooded by Zachary Lubbets). *Asymptotics and Statistical Inference in High-Dimensional, Low-Rank Matrix Models*
- KE CHEN (2022) Advisor: Maxim Bichuch. *Deep Learning Schemes for Solving Multiasset Optimal Investment With Proportional Transaction Cost*
- WEI JIN (2022) Advisor: Yanxun Xu (Hooded by Daniel Q. Naiman). *Novel Bayesian Methods for Precision Medicine in HIV*
- VITTORIO LOPRINZO (2023) Advisor: Laurent Younes. *A Generative Model for Latent Position Graphs*
- YUANYE MA (2022) Advisor: Helyette Geman (Hooded by Fadil Santosa). *Essays on International Crude Oil Markets and Electricity Systems*
- CONG MU (2023) Advisor: Carey Priebe (Hooded by Fadil Santosa). *Chernoff Information in Community Detection*
- ZACHARY M. PISANO (2022) Advisor: Daniel Q. Naiman. *Towards an Occam Factor for Random Graphs*
- YASHIL SUKURDEEP (2023) Advisor: Nicolas Charon. *Elastic Shape Analysis of Geometric Objects With Complex Structures and Partial Correspondences*
- KUNBO WANG (2023) Advisor: Yanxun Xu (Hooded by Amitabh Basu). *Novel Statistical Methods for Latent Structure Identification and Decision Making in Medical Applications*
- NOAH JOHN WICHROWSKI (2022) Advisor: Yannis G. Kevrekidis (Hooded by Daniel Q. Naiman). *Data-driven Dimensionality Reduction: Manifold Learning for Optimization*
- YIRAN XU (2023) Advisors: Donald J. Geman and Laurent Younes. *Bayesian Non-parametric Model for Cell Type Characterization Using Single-cell Data*

DEPARTMENT OF BIOMEDICAL ENGINEERING

- HALEY ABRAMSON (2023) Advisor: Amir Manbachi. *Algorithmic Design for Ultrasound Devices in Neurosurgery*
- DI CAO (2022) Advisor: Jun Hua. *Contrast Enhanced MRI for the Measurement of Dynamic Signal Changes in the CSF and Cerebral Lymphatic Vessels*
- JOSHUA COHEN (2023) Advisor: Bert Vogelstein. *Liquid Biopsies for the Detection, Localization, and Management of Cancer*
- ALEXANDRIYA EMONDS (2022) Advisor: Charles E. Connor. *Neural Representation of Physical Object Properties in Higher Order Vision*
- YUNFAN FAN (2022) Advisor: Winston Timp. *Nanopore Sequencing for Infectious Disease Applications*
- HONGLI FAN (2023) Advisor: Hanzhang Lu. *Magnetic Resonance Imaging of Perfusion With MR Fingerprinting Arterial Spin Labeling*
- YUQI FANG (2023) Advisor: Andy Feinberg. *DNA Methylation Stochasticity Is Associated with Genetics, Epigenetics, and Embryonic Development*
- ANDREW FRASER (2023) Advisor: Andrew Ewald. *Branching Morphogenesis and Collective Migration of Mammary Epithelium Depend on Microtubule Organization and Dynamics*
- EDUARDO ANDRE GONZALEZ BELLIDO (2022) Advisor: Muyinatu A. Bell. *Ultrasound and Photoacoustics Techniques for Surgical Guidance Inside and Around the Spine*



- YUEQI GUO (2022) Advisor: Xiaoqin Wang. *Functional Organizations in the Auditory Cortex of the Common Marmoset Investigated by Optical Imaging Methods*
- HAMED HOOSHANGNEJAD (2023) Advisor: Kai Ding. *Precision Medicine for Application of Hydrogel Spacer in Image-guided Radiation Therapy*
- ARIEL ISSER (2022) Advisor: Jonathan Schneck. *Targeting CD4 T Cells With Nanotechnology for Enhanced Cancer Immunotherapy*
- WEN JIANG (2022) Advisor: Daniel Thorek. *Biological Effects of Alpha Particle Irradiation and Combination Therapies on Prostate Cancer Cells*
- JONGHOON LEE (2022) Advisor: Xiaoqin Wang. *Neural Coding of Conspecific Vocalizations in Auditory Cortex of Common Marmosets*
- JUSTIN LOWENTHAL (2023) Advisors: Leslie Tung and Sharon Gerecht. *Manipulating Signaling in Stem Cell-based Engineered Models of Cardiac Development and Disease*
- DAVID MAESTAS (2022) Advisor: Jennifer Elisseeff. *The Development of Type 2 Immune Agonists as Pro-regenerative Immunotherapies*
- EFI MAVROUDI (2023) Advisor: René Vidal. *Looking Into Actors, Objects, and Their Interactions for Video*
- GREGORY MCKAY (2022) Advisor: Nicholas Durr. *Towards Noninvasive Blood Counting and Analysis With Oblique Back-illumination Capillaroscopy*
- HO NAMKUNG (2022) Advisor: Akira Sawa. *Dimensional Approach-driven Investigation of Brain Function and Behavior in Health and Disease*
- HIEU NGUYEN (2023) Advisor: Eliseo Guallar. *Survival Analysis Using Machine Learning for Longitudinal, Multimodal, and High-dimensional Data for Applications in Cardiology*
- SIMON OROZCO (2023) Advisor: Reza Shadmehr. *Cross-axis Saccade Adaption in Humans and Marmosets: Behavior and Neurophysiology*
- ALEXIS PENA (2023) Advisor: Jennifer Elisseeff. *Immunological Characterization of Clinical Reconstructive Approaches*
- ROHAM RAZAGHI (2022) Advisor: Winston Timp. *Using Nanopore Sequencing To Interrogate the Genome and Epigenome*
- ROKSANA SADEGHI (2023) Advisor: Giselle Dagnelie. *Developing a Methodology To Assess Visual Perception With the Intra-cortical Visual Prosthesis*
- XIAOSHAN (MELODY) SHAO (2023) Advisor: Rachel Karchin. *High Throughput Computational Methods for Immuno-oncology: Precise Patient Stratification Based on Neoantigen Profile Analyses*
- CHIA-YI SU (2022) Advisor: Deok-Ho Kim. *Engineering Biomimetic Tumor Microenvironments With Controllable Stromal Topography for Studying Cancer Cell Dissemination*
- EMILY SU (2023) Advisor: Patrick Cahan. *Computational Tools To Explore Cell Identity Transitions with Application to Cell Fate Engineering*
- ERIC SUNG (2022) Advisor: Natalia Trayanova. *Characterizing the Post-infarct Ventricular Tachycardia Substrate Using Clinical Data and Personalized Computational Heart Modeling*
- TONY WU (2022) Advisor: Kannan Rangaramanujam. *Novel Dendrimer-biologics Conjugates for Cell-targeted Treatment of Neurodegenerative and Ocular Diseases*
- WANG XI (2022) Advisor: Michael Beer. *Probabilistic Modeling of Chromatin Interactions*
- XIAOXUAN (ESME) ZHANG (2023) Advisor: Jeffrey Siewerdsen. *Improved Intraoperative Imaging, Registration, and Guidance for Neurosurgery*

DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

OMKAR MANDAR BHATAVDEKAR (2022) Advisor: Stavroula Sofou. *Studies on Optimizing Delivery of Chemotherapeutics: From Informing In Silico Drug Delivery Models to Developing Therapeutic Regimens to Overcome Hypoxia-mediated Resistance*

QI HUANG (2023) Advisor: David Gracias. *Solvent Responsive Self-folding Architectures for Photo Electronics and Bioelectronics*

JACKSON JENKINS (2023) Advisor: Michael J. Betenbaugh. *Metabolomics-driven Engineering and Design to Improve Biomolecule Production*

ADITYA JOSYULA (2022) Advisor: Laura Ensign-Hodges. *Engineering Nanostructured Medical Devices and Formulations for Improving Surgical Outcomes*

JENNY AMJAD JUMAI'AN (2022) Advisor: Michael Bevan (Hooded by Paulette Clancy). *kT-Scale Interactions of Ethylene Oxide and Zwitterionic Copolymers With Blood Proteins and Mucus*

KAM SANG (MARK) KWOK (2023) Advisor: David Gracias. *Engineering 3D Nanointerfaces via Mechanical Assembly and Top-down Fabrication for Energy, Diagnostic, and Cellular Applications*

SE JONG LEE (2023) Advisor: Konstantinos Konstantopoulos. *Effects of Acidosis on Tumor Cell Function*

MAYA KATHLEEN MONROE (2023) Advisor: Honggang Cui. *Converting Antiviral Therapeutics Into Supramolecular Hydrogelators for Improved Antiviral Treatment*

HARNISH MUKESH NAIK (2022) Advisor: Michael J. Betenbaugh. *Unraveling CHO Metabolic Processes Using Stable Isotope Labeling To Enhance Bioprocess Performance*

YORGOS PSARELLIS (2022) Advisor: Yannis G. Kevrekidis (Hooded by Stavroula Sofou). *Data-assisted Modeling of Complex Chemical and Biological Systems*

PAUL ROBERTS (2022) Advisor: Joelle Frechette. *Characterizing Interfacial Phenomena in Complex and Heterogeneous Soft Materials*

OLUWASEUN ROMILUYI (2022) Advisor: Paulette Clancy. *Investigating the Impact of Lewis Acid and Base Interactions on the Solution Processing of Metal Halide Perovskite Solar Cells Through Molecular Simulation and Machine Learning Approaches*

MISHA RUBANOV (2023) Advisor: Rebecca Schulman. *Pattern Transformation Using Programmable DNA-functionalized Hydrogels*

BLAIRE SORENSON (2022) Advisor: Paulette Clancy. *Perovskite Precursor Solutions Are Simple: A Theoretical Study of the Methylammonium Lead Iodide Solution Species*

RACHEL STEIN HENDLEY (2022) Advisor: Michael Bevan (Hooded by Paulette Clancy). *Understanding and Controlling Anisotropic Particle Assembly Using Electric Fields*

DAVID STERN (2022) Advisor: Honggang Cui. *Harnessing the High-affinity Interactions Between Supramolecular Polymers and Proteins for Antibody Separation and Long-acting Release*

DEREK VANDYKE (2023) Advisor: Jamie Spangler. *Development of Novel Platforms for Engineering Targeted Therapeutic Proteins*

HAN WANG (2022) Advisor: Honggang Cui. *Peptide-drug Conjugates: From Supramolecular Polymers to Covalent Polymeric Networks*

FEI XU (2022) Advisor: Chao Wang. *Electrochemical Engineering for Critical Elements Recovery and Utilization*

LEI ZHANG (2023) Advisor: Rebecca Schulman. *Programming Mechanochemical Sensing and Responses in Hydrogels With Biochemical Circuits*



DEPARTMENT OF CIVIL AND SYSTEMS ENGINEERING

- JULIA CARROLL (2023) Advisor: James K. Guest. *Topology Optimization for Electron Beam Freeform Fabrication and Regularization of Discrete Object Projection*
- CHU DING (2022) Advisor: Benjamin W. Schafer. *Strength and Behavior of Advanced High-strength Steel Structural Components*
- KATIANA KONTOLATI (2023) Advisor: Michael D. Shields. *Leveraging Intrinsic Model and Data Structures for Predictive Physics-based Modeling and Uncertainty Quantification*
- CHUAN LUO (2023) Advisor: James K. Guest. *Design Optimization of Fiber-reinforced Composite Laminates With Manufacturing Constraints*
- RACHEL RUDINGER (2019) Advisor: Benjamin D. Van Durme. *Decompositional Semantics for Events, Participants, and Scripts in Text*
- JINLEI SHEN (2022) Advisor: Somnath Ghosh. *Multiscale Modeling of Deformation and Microtexture Region Effect on Fatigue Crack Nucleation in Two-phase Titanium Alloy Using Parametrically Upscaled Constitutive Models*
- LOHIT VANDANAPU (2022) Advisor: Michael D. Shields. *Efficient Simulation of Higher-order Non-Gaussian/Non-stationary Stochastic Processes: An FFT Approach*
- XIA YAN (2022) Advisor: Thomas Gernay. *Performance-based Fire Design of Cold-formed Steel Structures Made of New High-strength Steels*
- ZHIDONG ZHANG (2023) Advisor: Benjamin W. Schafer. *Simulation and Performance of Steel Sheet Sheathed Shear Walls in CFS-framed Building Systems*

DEPARTMENT OF COMPUTER SCIENCE

- ZHIHAO BAI (2022) Advisor: Xin Jin (Hooded by Randal Burns). *Runtime Scheduling and Updating for Deep Learning Applications*
- ALISHAH AMIR CHATOR (2023) Advisor: Matthew Green. *Practice-oriented Privacy in Cryptography*
- HAOMIN CHEN (2023) Advisors: Greg Hager and Mathias Unberath (Hooded by Mathias Unberath). *Towards Interpretable Machine Learning in Medical Image Analysis*
- NAE-CHYUN CHEN (2022) Advisor: Benjamin Langmead. *Reducing Reference Bias in Genomic Sequence Data Processing*
- QI CHEN (2022) Advisor: Alan L. Yuille. *On the Use of Vision and Range Data for Scene Understanding*
- PRITHVIRAJ DHAR (2022) Advisor: Rama Chellappa. *Building Trustworthy AI for Biometrics Systems*
- SHUOYANG DING (2022) Advisor: Philipp Koehn. *Runtime Audit of Neural Sequence Models for NLP*
- CONG GAO (2022) Advisors: Mehran Armand and Mathias Unberath. *Fluoroscopic Navigation for Robot-assisted Orthopedic Surgery*
- AARUSHI GOEL (2022) Advisor: Abhishek Jain. *MPC for Everyone*
- PENGFEI GUO (2023) Advisor: Vishal Patel. *Deep Learning-based Methods for Improving Accelerated Magnetic Resonance Image Reconstruction*
- KATHARINE ELIZABETH HENRY (2020) Advisor: Suchi Saria. *Translating Machine Learning Into Clinical Practice: Lessons From Development to Deployment*
- NILS HOLZENBERGER (2022) Advisor: Benjamin D. Van Durme. *Computational Statutory Reasoning*
- ZHENGZHONG JIN (2022) Advisors: Abhishek Jain and Xin Li. *Noninteractive Proofs: What Assumptions Are Sufficient?*



DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

JUNYU CHEN (2022) Advisor: Eric Frey. *Development of Quantitative Bone SPECT Analysis Methods for Metastatic Bone Disease*

ARLENE CHIU (2023) Advisor: Susanna Thon. *Engineering Quantum Nanomaterials for Solar Cell Applications*

JAEJIN CHO (2022) Advisor: Najim Dehak. *Learning Utterance-level Representation From Speech*

MICHELLE GRAHAM (2022) Advisor: Muyinatu A. Bell. *Theoretical, Simulated, and Experimental Photoacoustic Approaches To Detect the Internal Carotid Artery During Minimally Invasive Neurosurgery*

SHOUJING GUO (2022) Advisor: Jin U. Kang. *Intraoperative Optical Coherence Tomography Guided Deep Anterior Lamellar Keratoplasty*

JAMES DONALD GUTHRIE (2022) Advisor: Enrique Mallada Garcia. *Novel Representations of Semialgebraic Sets Arising in Planning and Control*

PIRAZH KHORRAMSHAHI (2023) Advisor: Rama Chellappa. *Design of Attention Mechanisms for Robust and Efficient Vehicle Re-identification from Images and Videos*

VELAT KILIÇ (2023) Advisor: Mark A. Foster. *Optical Systems and Signal Processing for Sensing and Computing*

XIAOYANG LIU (2022) Advisor: Paul A. Bottomley. *Advanced Intravascular Magnetic Resonance Imaging With Interaction*

SHAO-YUAN LO (2023) Advisor: Vishal Patel. *Robust Computer Vision Against Adversarial Examples and Domain Shifts*

NEIL STUART MACFARLANE (2022) Advisor: Amy C. Foster. *Multilayer and Heterogeneous Integrated Photonics*

IAN MITRA McLANE (2023) Advisor: James West (Hooded by Mounya Elhilali). *Improving Respiratory Sound Monitoring and Analysis Through Noise Control, Sensor Design, and Real-world Considerations*

RANJANI SRINIVASAN (2023) Advisor: Ilya Shpitser. *Beyond Classical Causal Models: Path Dependence, Entangled Missingness, and Generalized Coarsening*

JONAH PAUL SENGUPTA (2022) Advisor: Andreas Andreou (Hooded by Ralph Etienne-Cummings). *Co-design of Algorithms and Architectures for Embedded, Event-based Machine Perception*

MUHAN SHAO (2022) Advisor: Jerry Ladd Prince. *Multimodal MRI Analysis Using Deep Learning Methods*

SHUWEN WEI (2022) Advisor: Jin U. Kang. *Optical Coherence Tomography Ophthalmic Surgical Guidance*

ALYCEN WIACEK (2022) Advisor: Muyinatu A. Bell. *Coherence-based Ultrasound and Photoacoustic Imaging with Applications in Breast Mass Diagnosis and Hysterectomy Guidance*

DEPARTMENT OF ENVIRONMENTAL HEALTH AND ENGINEERING

CHRISTOPHER BRUECK (2023) Advisor: Carsten Prasse. *Determining the Fate of Organic Contaminants in Agricultural Systems: Applications for High-resolution Mass Spectrometry*

CASSANDRA COSANS (2022) Advisor: Ciaran Harman. *Landscape Structure, Flow Path, and Transport Co-evolution in the Deeply Weathered Piedmont*

PENGCHENG DING (2023) Advisor: Benjamin Hobbs. *Bi-level Proactive Transmission Planning Considering Transmission and Distribution Network Cost Recovery*



TIANQI LIU (2023) Advisor: Ciaran Harman. *Hydrologic Transfer Processes of Water, Salt, and Energy on the Bonneville Salt Flat*

YUE ZHANG (2022) Advisor: Sarah Preheim. *Role of Microorganisms in Surface Water Remediation Technologies: Examples From Stormwater Biofiltration and Artificial Aeration in a Hypoxic Estuarine Zone*

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

OJASWI AGARWAL (2022) Advisor: Kevin J. Hemker. *Investigating Polycarbonate Welds Made With Fused Filament Fabrication*

TAEIN D. LEE (2022) Advisor: Howard E. Katz. *Analysis and Control of Electrical Properties of Organic Materials Based on Morphological and Structural Characteristics for Various Device Applications*

CHENHU QIU (2023) Advisor: Howard E. Katz (Hooded by Hai-Quan Mao). *Engineering Injectable Delivery Systems for Sustained Release of Protein in Nerve Repair and Regeneration*

CHUHONG WANG (2022) Advisor: Timothy K. Mueller. *Computational Studies of Interfaces and Coatings for Solid-state Batteries Using On-the-Fly Machine Learning*

DEPARTMENT OF MECHANICAL ENGINEERING

KARUNA AGARWAL (2022) Advisor: Joseph Katz. *The Pressure Field, Nuclei Dynamics, and Their Relation to Cavitation Inception in a Turbulent Shear Layer*

SHANTANU SACHIN BAILOOR (2023) Advisor: Rajat Mittal. *Hemodynamics of Native and Bioprosthetic Aortic Valves: Insights from a Reduced Degree-of-Freedom Model*

MAHSAN BAKHTIARINEJAD (2023) Advisor: Mehran Armand. *Robot-assisted Orthopaedic Surgery Interventions With Biomechanical Guided Planning and Analysis of Novel Implant Designs*

GABRIEL EITAN BARABAN (2022) Advisor: Marin Kobilarov (Hooded by Louis Whitcomb). *Uncrewed Aerial Vehicle Fruit Picking With Perceptual Imitation Learning Trajectory Generation*

CONNOR BRADFIELD (2022) Advisor: Kaliat T. Ramesh. *Traumatic Axonal Injury in the Mouse Brain*

XIANYANG CHEN (2022) Advisor: Gretar Tryggvason (Hooded by Tamer Zaki). *Exploring Reduced Order Models for Multiphase Flows That Retain Sharp Interfaces*

CHAOJUN CHENG (2022) Advisor: Sean X. Sun. *The Microfluidic Components of the Freeform Stimulator for Neural Modulation*

ALI EBRAHIMI (2022) Advisor: Iulian I. Iordachita. *Control and Estimation Methods Towards Safe Robot-assisted Eye Surgery*

QIYUAN FU (2023) Advisor: Chen Li. *Snake and Snake Robot Locomotion in Complex, 3D Terrain*

CHENGDA JI (2023) Advisor: Dennice Gayme. *Analysis, Control, and Optimization of Networked Dynamical Systems Under Uncertainty*

JIBU TOM JOSE (2022) Advisor: Joseph Katz. *On the Interplay Between Flow and Pressure Fields Around an Airfoil Undergoing Dynamic Stall*

SRIVATHSAN KALYAN (2022) Advisor: Soojung Claire Hur. *Expanding Vortex Trapping and Electroporation Capabilities to Small Cells*

SUBHRA SHANKHA KOLEY (2022) Advisor: Joseph Katz. *Impact of Axial Casing Groove Geometry on the Evolution of Flow Structures and Turbulence in an Axial Compressor*



DANIEL W. CHEW (2022) Advisor: A. Brinton Cooper. *A Case Study in Physical-Layer Steganography Applied to Multicarrier Transmissions*

JESSICA DEGNER (2022) Advisor: Rajat Mittal. *Novel Heatsink Designs Utilizing Microjet Impingement Cooling in Electronic Packaging*

PETER GU (2022) Advisor: Tamas Budvari. *Towards Optimal Line-of-Sight Coverage*

JEREMY GWINNUP (2023) Advisor: Kevin K. Duh. *Improving Machine Translation Quality With Multimodal Augmentation*

EDWARD BRENT LAIRD (2022) Advisor: Trac Duy Tran. *Quasinorm Regression for Localization Estimation*

ASHLEY LLORENS (2023) Advisor: Raman Arora. *Reinforcement Learning in a System Lifecycle*

TESSA VAN VOLKENBURG (2023) Advisor: Sung Hoon Kang. *Aqueous Sample Preparation for Improved In Situ Biosignature Detection at Ocean Worlds*

HISTORY OF ACADEMIC REGALIA

The doctorate of philosophy is the highest academic degree offered by a university. It signifies years of hard work and creativity, resulting in noteworthy research and scholarship that advances the body of human knowledge. Today's hooding ceremony honors our doctoral students, recognizing their tremendous achievement, as well as the mentorship of their devoted Advisers.

The tradition of academic dress dates back to the 12th century, when universities were taking shape in Europe. Academic robes developed for a number of reasons, including ensuring the warmth of scholars, who toiled in poorly heated spaces. Because of the close connection between universities and the church, scholars were often clerics. Many scholars had tonsured—or shaved—heads, so hoods were a practical way to keep them warm. Universities did not always have dedicated campuses, so clerical garb also served to set scholars apart. In the 14th century, the University of Coimbra issued the first formal order requiring their scholars to wear gowns. During the reign of King Henry VII in the 16th century, the universities of Oxford and Cambridge adopted a more comprehensive code of academic dress, the origin of what is used today.

The practice of wearing academic regalia in the United States dates to colonial times, when the schools that are today Columbia and Princeton universities continued England's tradition of the daily use of academic costume for scholars. After the Civil War, the use of gowns was largely relegated to formal events, such as commencement. In 1887, Williams College had the first college-specific gowns designed for graduation. In 1895, the Intercollegiate Commission adopted a code of academic dress, regulating all aspects of gowns including their cut, style, color, and material. Today, the American Council on Education oversees the codification of academic regalia, last amended in 1987. Hoods for the doctoral degree are four feet in length, while those for bachelor's and master's degrees are three- and three-and-a-half feet respectively. Only the doctoral hood is lined, using the official colors of the university conferring the degree—sable and gold in the case of Johns Hopkins.

Today you are formally presented with your hood, the outward symbol of your accomplishments as a scholar. In donning this hood, you join a line of scholars dating back centuries, a line of scholars who have worked to advance the body of knowledge for humanity since the Middle Ages. Johns Hopkins is honored to present you with this hood, which proclaims to the world that you are the best of our university.

Congratulations.

