

# Advanced Research and Technology Symposium



# 2018

Join a community of academics, students, and entrepreneurs. Hear about groundbreaking new technologies that are being brought to bear to address national security challenges. Learn how you can engage in these exciting technology frontiers.

## 5–6 March

### MIT Tang Center

Wong Auditorium  
(Building E51)  
70 Memorial Drive  
Cambridge, MA 02144

### Symposium Office

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Dear Colleague,

We are pleased to invite you to the fourth MIT Lincoln Laboratory Advanced Research and Technology Symposium (ARTS), which will be held on 5–6 March 2018 at the MIT Tang Center in Cambridge, Massachusetts.

The major objective of this symposium is to reach out to academics, students, and entrepreneurs on the MIT campus and in the New England area to encourage and enable the development of advanced technologies in support of national security. The symposium will highlight some of the most pressing challenges confronting our nation's security and well-being, and how advanced technology can help to address these challenges. Our goal is to stimulate interaction and suggest opportunities to develop new technologies, many of which will have both commercial and defense applicability.

Sessions will highlight recent technology challenges and revolutionary work that is ongoing at MIT's campus and MIT Lincoln Laboratory in areas that will figure prominently in the future of national security:

- Data-starved artificial intelligence
- Smart super vehicles
- The future of advanced (secure) computing
- Revolutions in biotechnology
- Materials integration: from nanoscale to waferscale

An agenda follows this overview to provide more detail on each session. The agenda also includes a set of associated poster presentations and a session on ways to engage. The poster sessions display other relevant and groundbreaking research projects and provide the audience with the opportunity to interact firsthand with the session speakers and their colleagues. The final session focuses on ways to engage with Lincoln Laboratory, MIT, and the U.S. Government to develop research collaborations and other business opportunities.

We hope you can join us, and very much look forward to your participation.

Sincerely,

Robert A. Bond  
Chief Technology Officer  
MIT Lincoln Laboratory

Day 1

Monday  
5 March

PRELIMINARY AGENDA

Advanced Research  
and Technology  
Symposium

2018



0800	Arrival/Sign In	
0830	Welcome/Administration	
0845	<b>Technology for National Security</b>	<b>Chair: Mr. Robert Bond</b>
0845	<i>National Security Keynote</i>	Dr. Melissa Flagg, Former Deputy Assistant Secretary of Defense for Research, Office of the Assistant Secretary of Defense, Research and Engineering
0930	ARTS and National Security	Mr. Robert Bond, MIT LL
1000	Break	
	<b>Data-Starved Artificial Intelligence</b>	<b>Chair: Dr. Sanjeev Mohindra</b>
1015	Data-Starved AI	Dr. Sanjeev Mohindra, MIT LL
1030	AI Horizons	Prof. Antonio Torralba, MIT
1100	Computer-on-Watch	Mr. Arjun Majumdar, MIT LL
1115	Teaming with the AI Cyber Warrior	Dr. William Streilein, MIT LL
1130	Probabilistic Computing for Data-Starved Artificial Intelligence	Prof. Vikash Mansinghka, MIT
1200	Lunch and Poster Session	
	<b>Smart Super Vehicles</b>	<b>Chair: Mr. Scott Van Broekhoven</b>
1300	Building Smart Super Vehicles	Mr. Scott Van Broekhoven, MIT LL
1315	Preliminary Development of the "Firefly" Rocket Powered UAV	Prof. John Hansman, MIT
1335	A Safe High Energy Density Source of Hydrogen	Prof. Doug Hart, MIT
1355	Undersea Communications	Dr. Scott Hamilton, MIT LL
1410	Next-generation Augmented Reality and Virtual Reality Development Environments for UAV Research	Prof. Sertac Karaman, MIT
1430	Break	
	<b>The Future of Advanced (Secure) Computing</b>	<b>Chair: Dr. Paul Monticciolo</b>
1445	The Future of Advanced (Secure) Computing	Dr. Paul Monticciolo, MIT LL
1500	Challenges in Building Secure Hardware Platforms	Prof. Srin Devadas, MIT
1530	An Inherently Secure Computer	Dr. Hamed Okhravi, MIT LL
1545	Data-Centric Secure Computing	Dr. Emily Shen, MIT LL
1600	Quantum Computing	Dr. Eric Dauler, MIT LL
1615	DataSToRM: Data Science and Technology Research Environment	Mr. Vitaliy Gleyzer, MIT LL
1630	Break	
1645	<b>Poster Session/Reception</b>	
1815	Adjourn	

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Day 2  
**Tuesday**  
**6 March**

PRELIMINARY AGENDA

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0800	Arrival/Sign In	
0830	Welcome/Administration	
	<b>Revolutions in Biotechnology</b>	<b>Chair: Mr. Edward Wack</b>
0845	Warfighter Health and Performance	Mr. Edward Wack, MIT LL
0900	The Brain-Immune-Gut Super System and the Emergence of Human Chronic Disease	Dr. Joe Bolen, PureTech Health
0930	Diamond Sensors for Brain Imaging	Dr. Danielle Braje, MIT LL
0945	Microelectronics Interfacing Neural Devices (MIND)	Dr. Albert Swiston, MIT LL
1000	Microbiome	Dr. Catherine Cabrera, MIT LL
1015	Break	
	<b>Materials Integration: from Nanoscale to Waferscale</b>	<b>Chair: Dr. Mark Gouker</b>
1030	Materials Integration: from Nanoscale to Waferscale	Dr. Mark Gouker, MIT LL
1040	Squitch: Nano-Engineered Squeezable Electro-Mechanical Switch	Prof. Vladimir Bulovic, MIT
1100	Microhydraulic Actuators: Artificial Muscle and More	Dr. Jakub Kedzierski, MIT LL
1120	Prototype Photonic Integrated Circuit (ProtoPIC) Platform and Applications	Dr. David Kharas, MIT LL
1140	Wafer-Scale Satellites	Dr. Livia Racz, MIT LL
1200	Functional Fiber Microsystems	Dr. Alexander Stolyarov, MIT LL
1220	Lunch and Poster Session	
	<b>Ways to Engage</b>	<b>Chair: Dr. Israel Soibelman</b>
1340	Innovation in Support of National Security	Dr. Israel Soibelman, MIT LL
1400	Short Introductions/Presentations	Dr. Israel Soibelman, MIT LL Dr. Melissa Flagg, ARL Northeast Dr. Bernadette Johnson, DIUx Mr. Warren Katz, Techstars Boston Dr. Charlene Stokes, MITRE Dr. Nathan Wiedenman, DRAPER
1420	Panel Discussion	Panelists/Audience Participation
	<b>Horizons Near and Far</b>	<b>Chair: Mr. Robert Bond</b>
1500	Closing Remarks	Mr. Robert Bond, MIT LL
1530	Adjourn	

# Poster Sessions

<b>Data-Starved Artificial Intelligence</b>	<b>Chair: Dr. Sanjeev Mohindra</b>
Computer Vision in Low Resource Environments	Mr. David Mascharka, MIT LL
Teaming with the AI Cyber Warrior	Dr. William Streilein, MIT LL
Adaptable Interpretable Machine Learning	Dr. Jonathan Su, MIT LL
Threat Network Detection: Countering Weaponization of Social Media	Dr. Olga Simek, MIT LL
<b>Smart Super Vehicles</b>	<b>Chair: Mr. Scott Van Broekhoven</b>
Verification for Tactile Intelligence in Motion	Mr. Mark Donahue, MIT LL
Decentralized Coordination of Autonomous Systems	Mr. John Griffith, MIT LL
Biomimetic Adaptive SONAR for Object Recognition	Mr. Kevin Arsenault, MIT LL
Hybrid-Power for Industrial Strength Commercial UAV Applications	Dr. Paul DeBitetto, Top Flight Technologies
<b>The Future of Advanced (Secure) Computing</b>	<b>Chair: Dr. Paul Monticciolo</b>
Big Data Processing for DoD IoT and AI	Dr. Siddharth Samsi/ Dr. Vijay Gadepally, MIT LL
Efficient Computing for the Internet of Things (IoT)	Dr. Karen Gettings/ Dr. Huy Nguyen, MIT LL
Custom Processor Architectures for Probabilistic Programming	Dr. William Song, MIT LL
<b>Revolutions in Biotechnology</b>	<b>Chair: Mr. Ed Wack</b>
Large-Scale Brain Mapping	Dr. Laura Brattain, MIT LL
A Brain Computer Interface for Hearing Aid Design	Dr. Christopher Smalt, MIT LL
Wearable System for Near-Infrared Brain Imaging	Dr. Megan Blackwell, MIT LL
Sensorimotor Tracking of Neurological Disorders: mTBI	Dr. Adam Lammert, MIT LL
Inhalable Nanosensors for Rapid Breath-based Pathogen Identification in Respiratory Infection	Dr. Ta-Hsuan Ong, MIT LL/ Dr. Leslie Chan, MIT
<b>Materials Integration: from Nanoscale to Waferscale</b>	<b>Chair: Dr. Mark Gouker</b>
Additive Manufacturing with Electronic Materials	Dr. Bradley Duncan, MIT LL
Planar-Lens-Enabled Beam Steering for Chip-Scale LIDAR	Dr. Cheryl Sorace-Agaskar, MIT LL/ Dr. Josué Lopez, MIT
Biological Nanofluidic Systems	Dr. Melissa Smith, MIT LL
Optical Phase Change Metamaterial	Mr. Jeffrey Chou, MIT LL
<b>Ways to Engage</b>	<b>Chair: Dr. Israel Soibelman</b>
Advanced Concepts Committee: Supporting Breakthrough Ideas	Dr. Brian Tyrrell, MIT LL

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