The image shows a large, industrial-scale cryogenic system for quantum computing. It consists of several tall, rectangular metal cabinets with perforated doors, arranged in a row. The central cabinet has the text "IBM Quantum System Two" printed on its front. The system is housed in a clean, modern environment with a light-colored floor and ceiling. The overall aesthetic is technical and futuristic.

IBM Quantum
System Two

The Emerging Technologies Race, Nuclear Weapons, and Global Security

A Scoping Workshop

June 14–16, 2023

SCIENCE &
GLOBAL SECURITY

PRINCETON UNIVERSITY

The Emerging Technologies Race, Nuclear Weapons, and Global Security

A scoping workshop

14-16 June 2023

Program on Science & Global Security
Princeton University

Meeting venue: [Bendheim House](#)

Wifi for guests: puvisitor

BACKGROUND

The United States, Russia, and China are engaged in a race to develop new technologies that carry significant military and global security implications. Advances in artificial intelligence, quantum technologies, sensors with continuous global coverage, along with hypersonic and maneuverable weapon systems, are rapidly being integrated into military structures and capabilities. Key goals are to accelerate the tempo of warfare by reducing the time to detect, target, and destroy military objectives, to expand to a global scale the space for such actions, and to conduct them with increased precision. This arms race is reinforced by elite and expert discourses characterized by over-promising, parity-seeking, and fears of falling behind. There are grounds, however, for skepticism and uncertainty in whether these technologies can yield a new revolution in military affairs within the foreseeable future.

If realized, this revolution could conceivably provide those with access to these new technologies with the capacity to threaten deployed nuclear delivery systems with successful counterforce attacks anywhere and at any time – signaling the obsolescence of nuclear forces as survivable, credible means of deterrence. Such a radical development could enable new interest in nuclear arms reduction and disarmament for some states. It also could drive other states towards even riskier postures and increase the likelihood of nuclear war. In either case, new forms of international cooperation aimed at restraining military capabilities, doctrines, postures, and escalation pathways will be required.

The introduction and weaponization of these new technologies pose significant challenges to the existing concepts and structures of arms control, as control regimes devised to constrain earlier generations of weaponry may not prove effective in regulating weapons equipped with these new technologies. Therefore, arms control advocates and international policymakers will have to consider which elements of the existing control architecture can be extended or adapted and determine what new mechanisms will have to be devised for this purpose.

To address these questions and explore potential policy responses to these new challenges, the Princeton Program on Science and Global Security is convening a group of scientists, technology experts, scholars, and policy specialists to assess the implications of emerging technologies on the futures of nuclear weapon policies in the United States, Russia, and China. The aim of this investigation is to better understand the compounding factors and risks associated with the rapid development, militarization, and deployment of emerging technologies, including the scientific and technical basis for any claims of potential transformative impacts, as well as possible arms control measures and other restraint options.

AGENDA

Welcome Dinner: Wednesday June 14, 2023, [Aspendos](#), 182 Nassau St, 18:30

DAY 1: Thursday June 15, 2023

9:00, Preliminary remarks, introductions and workshop goals, Sébastien Philippe (Princeton)

Part 1. Geopolitical context for current technological developments

Co-Chairs: Amy Nelson (Brookings), Zia Mian (Princeton)

9:30, US policies on emerging military technologies, Michael Klare (Arms Control Association)

10:00, US/China dynamics, Tong Zhao (Princeton)

10:30, US/Russia dynamics, Edward Geist (RAND)

11:00-12:30, Short break followed by discussion

12:30-13:30, *Lunch break*

Part 2. Emerging technologies: trends and potential for transformative impact

Co-Chairs: Leonor Tomero (LeoSpace) and Robert Lattiff (University of Notre Dame)

13:30, Emerging sensing capabilities from space, Igor Moric (Princeton)

14:15, Challenges and opportunities in Large-Scale Machine Learning, Daniel Suo (Google Deepmind)

15:00-15:30, *Break*

15:30, Quantum technologies, Michal Krelina (Czech Technical University)

16:15-17:30, General discussion

Dinner, [Mistral](#), 66 Witherspoon St, 18:30

DAY 2: Friday June 16, 2023

Part 3. Emerging capabilities and nuclear vulnerabilities

Co-Chairs: Anne Stickells (Princeton) and Kyle Evanoff (Princeton)

9:00, Survivability of strategic submarine forces, Tom Stefanick (Brookings)

09:45, AI and military Command and Control, Michael Klare (Arms Control Association) and Edward Geist (RAND)

10:30, Deep fake geospatial information, Alex Glaser (Princeton)

11:15-11:45, *Break*

11:45, Strategies to mitigate risks as seen from the UN, Beyza Unal (UNODA)

Part 4. Key Lessons for research and policy

Co-chairs: Steve Fetter (University of Maryland) & Sébastien Philippe (Princeton)

12:30-14:00, Discussion on possible future research and policy agendas and lunch.

14:00, End

WORKSHOP PARTICIPANTS

Elad Hazan is a Professor of Computer Science at Princeton University. His research focuses on the design and analysis of algorithms for basic problems in machine learning and optimization. He is the head of the Google Deepmind Lab in Princeton.

Sara Al-Sayed is a Postdoctoral Research Associate in the Program on Science and Global Security (SGS) at Princeton University. Her research centers on how new and emerging information technologies and procedures can support data collection, analysis, and secure reporting to empower civil society and whistle-blowers with regards to nuclear arms control, non-proliferation, and disarmament verification.

Christopher Chyba is the Dwight D. Eisenhower Professor in International Affairs and professor of astrophysical sciences at Princeton University. Chyba's current academic policy-relevant research focuses on possible pathways to nuclear weapons use (for two years, he co-chaired a project of the American Academy of Arts and Sciences on this topic), nonproliferation and strategic arms control issues, and biodefense.

Kyle Evanoff is a PhD student in the Politics Department at Princeton University, where he studies international relations and science, technology, and environmental policy. His research interests include international order, global governance, U.S. foreign policy, and global science and technology politics.

Steve Fetter is Associate Provost, Dean of the Graduate School, and Professor of public policy at the University of Maryland. He served for five years in the White House Office of Science and Technology Policy during the Obama Administration, where he led the environment and energy and the national security and international affairs divisions.

Edward Geist is a Policy Researcher at the RAND Corporation. His research interests include Russia (primarily defense policy), civil defense, artificial intelligence, nuclear weapons, and the potential impact of emerging technologies on nuclear strategy. His new book "Deterrence under Uncertainty: Artificial Intelligence and Nuclear Warfare" is forthcoming with Oxford University Press in Fall 2023.

Alex Glaser is an Associate Professor in the School of Public and International Affairs and in the Department of Mechanical and Aerospace Engineering. Glaser has been co-directing the Program on Science and Global Security since 2016. His research involves technical and policy analysis in three main areas: nuclear arms control, nuclear nonproliferation, and next-generation nuclear energy technologies.

Frank von Hippel is a senior research physicist and professor of public and international affairs emeritus with Princeton's Program on Science & Global Security which he co-founded.

Haneen Khalid is a PhD Student at the Princeton School of Public and International Affairs, studying International Security Studies. She was formerly an Obama Foundation Scholar at the University of Chicago. Her work focuses on transnational risk, including nuclear threats and climate change impacts on international stability and order. She is currently a Board Fellow at the Bulletin of Atomic Scientists and Board Member at International Student Young Pugwash.

Michael Klare, Five College Professor emeritus of peace and world security studies, and director of the Five College Program in Peace and World Security Studies (PAWSS), holds a B.A. and M.A. from Columbia University and a Ph.D. from the Graduate School of the Union Institute. He has written widely on U.S. military policy, international peace and security affairs, the global arms trade, and global resource politics.

Michal Krelina is a quantum security consultant at the European Union Agency for the Space Program (EUSPA) and a Research Scientist at the Czech Technical University in Prague, FNSPE. His research focus is on defense and security applications of quantum technology.

Manuel Kreutle has been a graduate student with the Princeton Program on Science and Global Security since 2022. Before that, he was a member of the Carl Friedrich von Weizsäcker-Centre for Science and Peace Research at the University of Hamburg, Germany, where he worked on nuclear disarmament verification and co-organizing the multinational "NuDiVe" and "NuDiVe 2022" disarmament verification exercises.

Robert H. Latiff is Adjunct Professor with the John J. Reilly Center for Science, Technology, and Values at the University of Notre Dame and research professor at George Mason University. He retired from the U.S. Air Force as a Major General in 2006. His research interests are weapons technology, downsides of rapid technology development and Just War Theory.

Zia Mian is a physicist and co-director of Princeton University's Program on Science and Global Security, part of the School of Public and International Affairs, where he has worked since 1997. His research interests include issues of nuclear arms control, nonproliferation and disarmament and international peace and security.

Igor Moric is a Postdoctoral Research Associate in the Program on Science and Global Security (SGS) at Princeton University. His research interests focus on nuclear verification and monitoring using emerging technologies.

Amy J. Nelson is a David M. Rubenstein Fellow in the Foreign Policy program and with the Strobe Talbott Center for Security, Strategy, and Technology at Brookings. Her research focuses on emerging, evolving, and disruptive technologies and their impact on proliferation, as well as improving the efficacy of arms control.

Sulgiye Park is a Senior Scientist in the Global Security Program at the Union of Concerned Scientists. Her work focuses on the front and back end of the nuclear fuel cycle, monitoring and verifying nuclear activities, and analyzing fissile materials stocks.

Sébastien Philippe is a Research Scholar with Princeton University's Program on Science and Global Security, part of the School of Public and International Affairs. His research focuses on policy and technological approaches to reducing nuclear weapons and emerging technologies risks to international peace and security.

Tom Stefanick is a Visiting Fellow in the Foreign Policy program at the Brookings Institution. From 1988 to 2018, he had a career in scientific consulting. He initiated and managed over a dozen technical efforts in machine learning, image recognition, autonomous planning, sensor modeling, and simulation of military operations and U.S. border security operations.

Anne Stickells is a PhD student in Security Studies at Princeton's School of Public and International Affairs. Prior to coming to Princeton, Anne worked at RAND as a research assistant, where several of her projects were related to nuclear policy. Anne graduated from Stanford in 2015 with a BA in Science, Technology, and Society, and a minor in Creative Writing.

Daniel Suo is a software engineer at Google Deepmind. His work focus on the scaling and optimization of Machine Learning and Artificial Intelligence algorithms. He holds a PhD in Computer Science from Princeton University.

Leonor Tomero is a Principal with LeoSpace LLC and a Commissioner with the Congressional Commission on the Strategic Posture of the United States. She served as the Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy in the Office of the Secretary of Defense. Prior to this role, she served for over a decade as counsel and strategic forces subcommittee staff lead on the House Armed Services Committee.

Beyza Unal is the Head of Science and Technology Unit at UNODA. She specializes in the interaction between emerging technology applications and their impact on international peace and security. Before joining UNODA, Beyza was the Deputy Director of the International Security Programme at Chatham House. She holds a PhD in International Studies from Old Dominion University.

Sharon K. Weiner is an Associate Professor of International Relations in the School of International Service at American University. She is an international expert on nuclear weapons politics, strategy, and force structure and the organizational politics and U.S. national security policy more broadly. Her current work focuses on the theory, practice, and social construction of deterrence and the politics of U.S. nuclear weapon modernization programs.

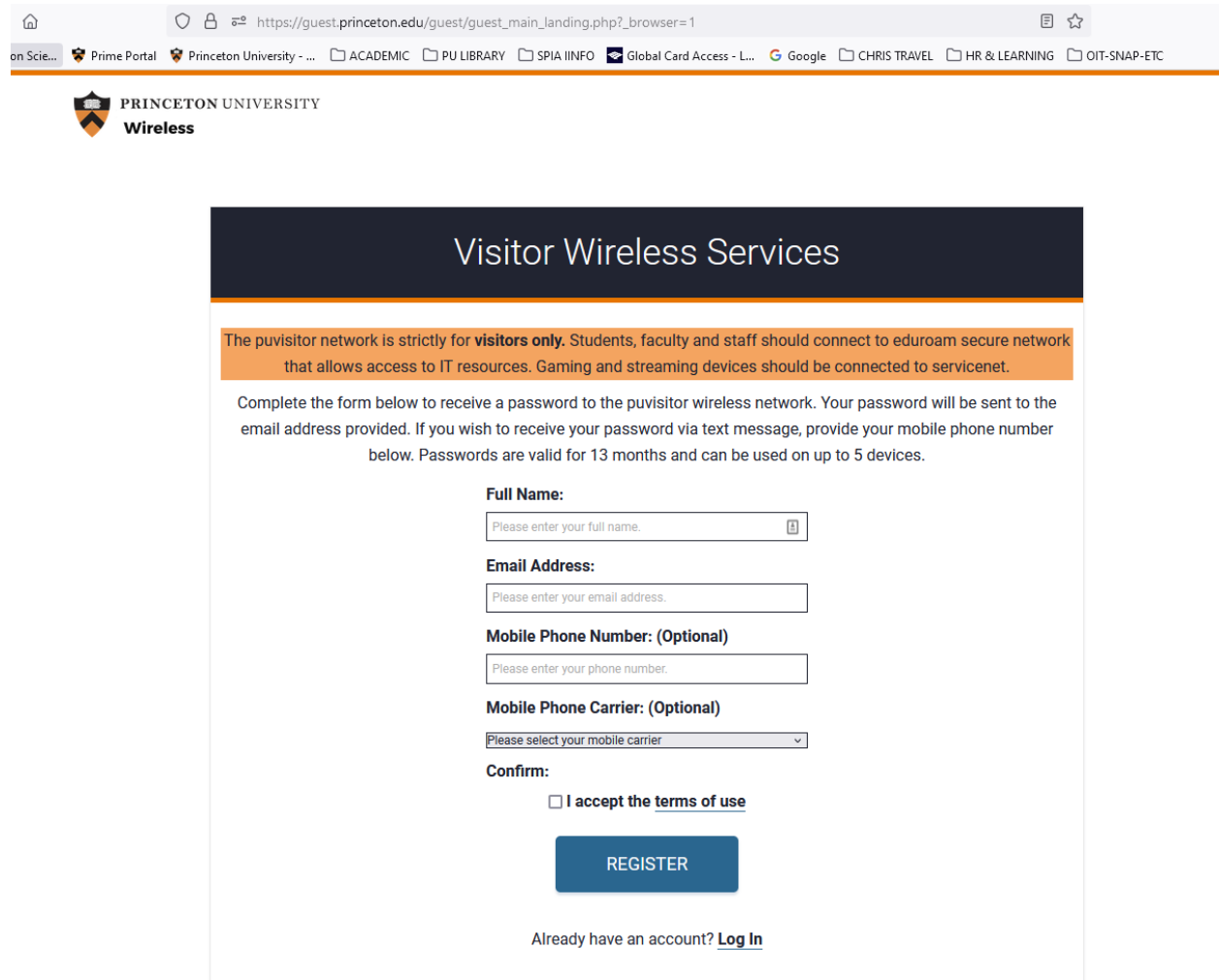
Tong Zhao is a Senior Fellow in the Nuclear Policy Program at the Carnegie Endowment for International Peace, as well as a Visiting Research Scholar at Princeton University's Science and Global Security Program. His research focuses on strategic security issues, such as nuclear weapons policy, deterrence, arms control, nonproliferation, missile defense, hypersonic weapons, and China's security and foreign policy.

WIRELESS ACCESS

Princeton University provides wireless internet service to campus visitors, who do not have eduroam credentials, through the Visitor Wireless service (puvisitor).

Complete the form at https://guest.princeton.edu/guest/guest_main_landing.php?_browser=1 to receive a password to the puvisitor wireless network.

Your password will be sent to the email address provided.

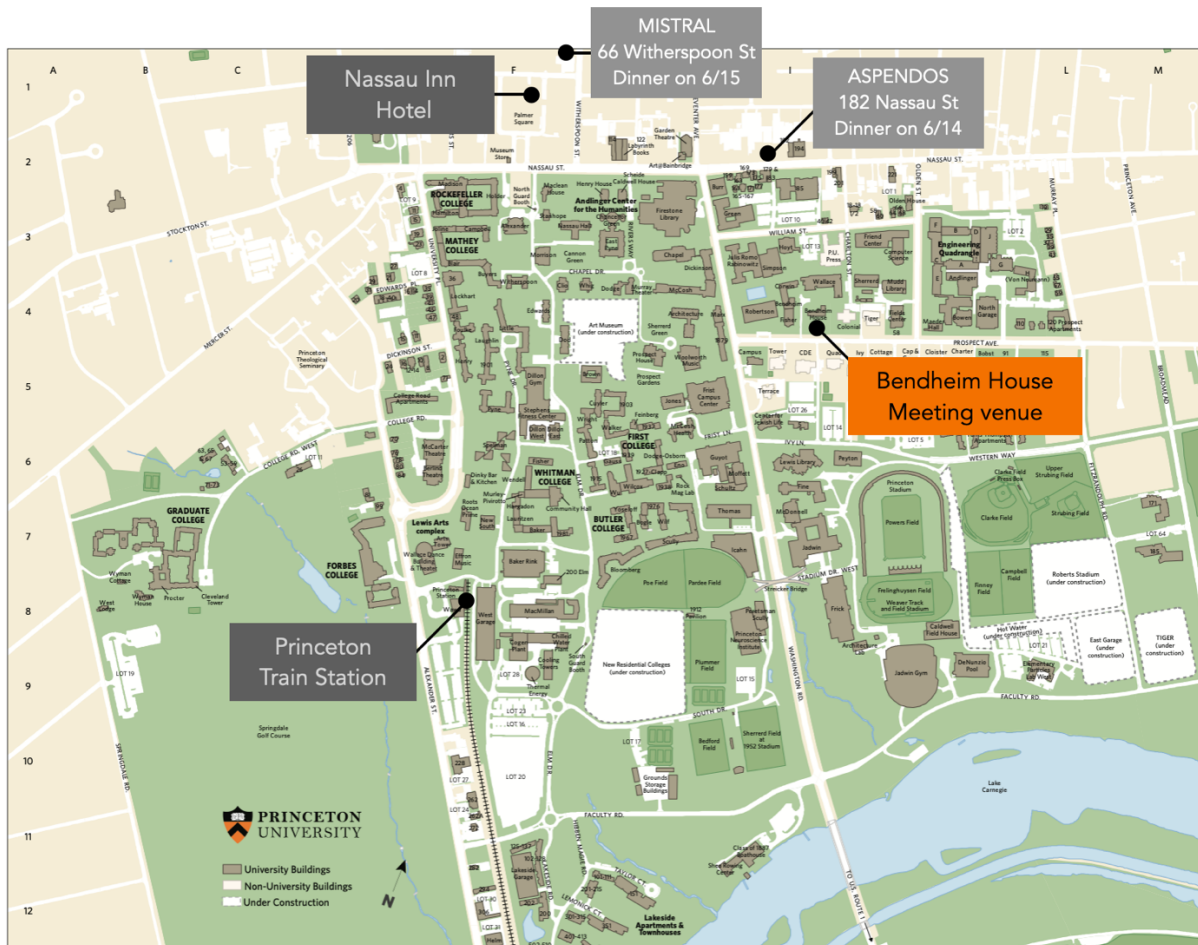


The screenshot shows a web browser window with the URL https://guest.princeton.edu/guest/guest_main_landing.php?_browser=1. The browser's address bar and tabs are visible. Below the browser window is the Princeton University Wireless logo. The main content area is a registration form titled "Visitor Wireless Services".

The form includes the following text and fields:

- Visitor Wireless Services** (Section Header)
- Notice:** The puvisitor network is strictly for **visitors only**. Students, faculty and staff should connect to eduroam secure network that allows access to IT resources. Gaming and streaming devices should be connected to servicenet.
- Instructions:** Complete the form below to receive a password to the puvisitor wireless network. Your password will be sent to the email address provided. If you wish to receive your password via text message, provide your mobile phone number below. Passwords are valid for 13 months and can be used on up to 5 devices.
- Full Name:** Text input field with placeholder "Please enter your full name."
- Email Address:** Text input field with placeholder "Please enter your email address."
- Mobile Phone Number: (Optional)** Text input field with placeholder "Please enter your phone number."
- Mobile Phone Carrier: (Optional)** Dropdown menu with placeholder "Please select your mobile carrier".
- Confirm:** A checkbox labeled "I accept the [terms of use](#)".
- REGISTER** (Blue button)
- Already have an account? [Log In](#)**

WORKSHOP MAP



Interactive campus map: <https://m.princeton.edu/default/map/index>

Meeting venue: [Bendheim House](#)

Hotel: [The Nassau Inn](#)