Bulletin
of the
Atomic
Scientists

It is now 85 seconds to midnight

2026 Doomsday Clock Statement

Science and Security Board
Bulletin of the Atomic Scientists

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IT IS 85 SECONDS
TO MIDNIGHT

Founded in 1945 by Albert Einstein, J. Robert Oppenheimer, and University of Chicago scientists who helped develop the first atomic weapons in the Manhattan Project, the Bulletin of the Atomic Scientists *created the Doomsday Clock two years later, using the imagery of apocalypse (midnight) and the contemporary idiom of nuclear explosion (countdown to zero) to convey threats to humanity and the planet. The Doomsday Clock is set every year by the* Bulletin*'s Science and Security Board in consultation with its Board of Sponsors, which includes eight Nobel laureates. The Clock has become a universally recognized indicator of the world's vulnerability to global catastrophe caused by man-made technologies.*

It is now 85 seconds to midnight

A year ago, we warned that the world was perilously close to global disaster and that any delay in reversing course increased the probability of catastrophe. Rather than heed this warning, Russia, China, the United States, and other major countries have instead become increasingly aggressive, adversarial, and nationalistic. Hard-won global understandings are collapsing, accelerating a winner-takes-all great power competition and undermining the international cooperation critical to reducing the risks of nuclear war, climate change, the misuse of biotechnology, the potential threat of artificial intelligence, and other apocalyptic dangers. Far too many leaders have grown complacent and indifferent, in many cases adopting rhetoric and policies that accelerate rather than mitigate these existential risks. Because of this failure of leadership, the *Bulletin of the Atomic Scientists* Science and Security Board today sets the Doomsday Clock at 85 seconds to midnight, the closest it has ever been to catastrophe.

Last year started with a glimmer of hope in regard to nuclear risks, as incoming US President Donald Trump made efforts to halt the Russia-Ukraine war and even suggested that major powers pursue "denuclearization." Over the course of 2025, however, negative trends—old and new—intensified, with three regional conflicts involving nuclear powers all threatening to escalate. The Russia–Ukraine war has featured novel and potentially destabilizing military tactics and Russian allusions to nuclear weapons use. Conflict between India and Pakistan erupted in May, leading to cross-border drone and missile attacks amid nuclear brinkmanship. In June, Israel and the United States launched aerial attacks on Iranian nuclear facilities suspected of supporting the country's nuclear weapons ambitions. It remains unclear whether the attacks constrained those efforts—or if they instead persuaded the country to pursue nuclear weapons covertly.

Meanwhile, competition among major powers has become a full-blown arms race, as evidenced by increasing numbers of nuclear warheads and platforms in China, and the modernization of nuclear delivery systems in the United States, Russia, and China. The United States plans to deploy a new, multilayered missile defense system, Golden Dome, that will include space-based interceptors, increasing the probability of conflict in space and likely fueling a new space-based arms race. As these worrying trends continued, countries with nuclear weapons failed to talk about strategic stability or arms control, much less nuclear disarmament, and questions about US

extended deterrence commitments to traditional allies in Europe and Asia led some countries without nuclear weapons to consider acquiring them. As we publish this statement, the last major agreement limiting the numbers of strategic nuclear weapons deployed by the United States and Russia, New START, is set to expire, ending nearly 60 years of efforts to constrain nuclear competition between the world's two largest nuclear countries. In addition, the US administration may be considering the resumption of explosive nuclear testing, further accelerating a renewed nuclear arms race.

An array of adverse trends also dominated the climate change outlook in the past year. The level of atmospheric carbon dioxide—the greenhouse gas most responsible for human-caused climate change—reached a new high, rising to 150 percent of preindustrial levels. Global average temperature in 2024 was the warmest in the 175-year record, and temperatures in 2025 were similar. With the addition of freshwater from melting glaciers and thermal expansion, global average sea level reached a record high. Energized by warm temperatures, the hydrologic cycle became more erratic, with deluges and droughts hopscotching around the globe. Large swaths of Peru, the Amazon, southern Africa, and northwest Africa experienced droughts. For the third time in the last four years Europe experienced more than 60,000 heat-related deaths. Floods in the Congo River Basin displaced 350,000 people, and record rainfall in southeast Brazil displaced over half a million.

The national and international responses to the climate emergency went from wholly insufficient to profoundly destructive. None of the three most recent UN climate summits emphasized phasing out fossil fuels or monitoring carbon dioxide emissions. In the United States, the Trump administration has essentially declared war on renewable energy and sensible climate policies, relentlessly gutting national efforts to combat climate change.

During the past year, developments in four areas of the life sciences have increased potentially catastrophic risks. In December 2024, scientists from nine countries announced the recognition of a potentially existential threat to all life on Earth: the laboratory synthesis of so-called "mirror life." Those scientists urged that mirror bacteria and other mirror cells—composed of chemically-synthesized molecules that are mirror-images of those found on Earth, much as a left hand mirrors a right hand—not be created, because a self-replicating mirror cell could plausibly evade normal controls on growth, spread throughout all ecosystems, and eventually cause the widespread death of humans, other animals, and plants, potentially disrupting all life on Earth. So far, however, the international community has not arrived at a plan to address this risk.

At the same time, the accelerating evolution of artificial intelligence poses a different sort of biological threat: the potential for the AI-aided design of new pathogens to which humans have no effective defenses. Also, concerns about state-sponsored biological weapons programs have deepened due to the weakening during this past year of international norms and mechanisms for productive engagement. Perhaps of most immediate concern is the rapid degradation of US public health infrastructure and expertise. This dangerously reduces the ability of the United States and other nations to respond to pandemics and other biological threats.

The increasing sophistication of large language models and their applications in

critical processes—coupled with lingering concerns about their accuracy and tendency to "hallucinate"—have generated significant public debate over the past year about the potential risks of artificial intelligence. The United States, Russia and China are incorporating AI across their defense sectors, despite the potential dangers of such moves. In the United States, the Trump administration has revoked a previous executive order on AI safety, reflecting a dangerous prioritization of innovation over safety. And the AI revolution has the potential to accelerate the existing chaos and dysfunction in the world's information ecosystem, supercharging mis- and disinformation campaigns and undermining the fact-based public discussions required to address urgent major threats like nuclear war, pandemics, and climate change.

These dangerous trends are accompanied by another development that undermines efforts to deal with major global threats: the rise of nationalistic autocracy in countries around the world, including in a number of countries that possess nuclear weapons. Leaders of the United States, Russia, and China greatly vary in their autocratic leanings, but they all have approaches to international relations that favor grandiosity and competition over diplomacy and cooperation. The rise of autocracies is not in itself an existential threat, but an us-versus-them, zero-sum approach increases the risk of global catastrophe. The current autocratic trend impedes international cooperation, reduces accountability, and acts as a threat accelerant, making dangerous nuclear, climatic, and technological threats all the harder to reverse.

Even as the hands of the Doomsday Clock move closer to midnight, there are many actions that could pull humanity back from the brink:

- The United States and Russia can resume dialogue about limiting their nuclear arsenals. All nuclear-armed states can avoid destabilizing investments in missile defense and observe the existing moratorium on explosive nuclear testing.
- Through both multilateral agreements and national regulations, the international community can take all feasible steps to prevent the creation of mirror life and cooperate on meaningful measures to reduce the prospect that AI be used to create biological threats.
- The United States Congress can repudiate President Trump's war on renewable energy, instead providing incentives and investments that will enable rapid reduction in fossil fuel use.
- The United States, Russia, and China can engage in bilateral and multilateral dialogue on meaningful guidelines regarding the incorporation of artificial intelligence in their militaries, particularly in nuclear command and control systems.

Our current trajectory is unsustainable. National leaders—particularly those in the United States, Russia, and China—must take the lead in finding a path away from the brink. Citizens must insist they do so.

It is 85 seconds to midnight.

Additional information on the threats posed by nuclear weapons, climate change, biological events, and the misuse of other disruptive technologies follows in the pages below.

Sliding further down a slippery nuclear slope

Last year started with a glimmer of hope raised by some encouraging remarks that incoming US President Donald Trump made regarding denuclearization, the dangers of nuclear weapons, and efforts to halt the Russia-Ukraine conflict. But 2025 ended with no reassuring nuclear developments. Rather, old and new negative trends solidified.

The year witnessed military operations in three theatres under the shadow of nuclear weapons, with each conflict posing a risk of escalation.

The risk of nuclear weapons use continued in the third year of the Russia–Ukraine war, which has featured innovative and potentially destabilizing military tactics and lightly veiled Russian nuclear threats. Russian drone incursions into NATO countries heightened European threat perceptions as the United States nudged European countries to take more responsibility for their own security by increasing defense spending. Meanwhile, Europeans continued debating nuclear deterrence options that do not involve the United States. Explorations include the possibility of a Euro-deterrent supported by the French and UK nuclear arsenals or by allowing other European countries to develop nuclear latency so they could quickly build nuclear weapons, if necessary. Similar conversations in South Korea and Japan have raised the specter of nuclear proliferation among countries that have traditionally been under the US nuclear umbrella.

In South Asia, a conflict between India and Pakistan broke out in May following an incident of cross-border terrorism in India. The conventional operations breached new redlines as they involved the first-ever use of drones and missiles and were accompanied by nuclear brinkmanship and disinformation campaigns. A ceasefire was obtained after 88 hours of fighting, but the risk of renewed conflict hangs over the two nuclear armed states.

In June, Israel and the United States launched aerial attacks on Iranian nuclear facilities suspected of supporting the country's nuclear weapons ambitions. The amount of damage caused by the attacks remains unclear, as does the fate of more than 400 kilograms of uranium that had been enriched to contain 60 percent of the fissile uranium 235 isotope—enough to build several nuclear weapons, even without further enrichment. With no concrete plans at hand to politically resolve the outstanding issues involving Iran's nuclear program, it is unclear whether the attacks constrained the Iranian program—or persuaded the country's leaders to pursue nuclear weapons covertly.

North Korea's nuclear build-up continued in 2025 with the testing of new delivery systems aimed at refining the country's nuclear triad. North Korea claimed to have tested a new intercontinental ballistic missile with a hypersonic delivery vehicle and also announced a nuclear-powered submarine. Russian assistance to North Korea's strategic nuclear and missile capabilities will likely expand, perhaps as a quid pro quo for North Korea sending soldiers to fight for Russia in the war against Ukraine—potential developments that drive

desire among some US allies to seek their own nuclear weapons.

As divisions between nuclear and non-nuclear countries deepen amid rising geopolitical tensions, the outlook for the Nuclear Non-Proliferation Treaty remains cloudy. With no progress on arms control, strategic competition among major powers is showing signs of becoming a full-blown arms race, as evidenced by rapidly increasing numbers of nuclear warheads and platforms in China; the US decision to begin the Golden Dome missile defense program; the continued modernization of nuclear delivery systems in the United States, Russia, and China; and new concerns about the possible resumption of nuclear testing. With each of those countries having leaders with nationalist and autocratic tendencies, nuclear issues are being framed around the importance of retaining strategic superiority. This sentiment spills over into other areas, such as the race for being the first to have a human settlement on moon, deploy new military applications of AI, or weaponize space.

Amid the geopolitical and technological tensions surrounding nuclear weapons, climate change concerns are driving interest in nuclear energy, including a growing optimism about small modular reactors. Consequently, several countries could emerge as first-time users of nuclear power. While there is no automatic connection between nuclear energy and proliferation of nuclear weapons, to ensure that the spread of nuclear energy does not spur proliferation, strong governance of the nuclear fuel cycle is needed. This, however, demands international consensus, a commodity in short supply in present times. Meanwhile, there are continuing safety and security concerns about nuclear power plants that have come under attack during the Russia-Ukraine war.

In 2025, the world slipped closer to normalizing nuclear risks. There was an almost complete absence of communication on strategic stability among nuclear adversaries and no sustained pressure from non-nuclear weapons countries for engagement. Also worrying is a lack of leadership on nuclear issues, with no country stepping up to stem the growing sense of disorder and breakdown of norms.

To prevent a further slide down the slippery slope toward catastrophe, international cooperation must replace international competition. First, to begin changing the negative atmosphere of the current nuclear moment, the United States and Russia should agree to adhere to the central limits of New START, conduct a data exchange in a sign of good faith, and immediately commence negotiations focused on the next steps in US-Russia arms control. Second, all nuclear adversaries must open dialogues to learn about each other's nuclear doctrines, current capabilities, and future plans, and to put in place channels of communication to ensure crisis prevention and management. Third, the countries with nuclear weapons should also make clear that they will not return to explosive nuclear testing, and that they support the NPT's core precepts.

These initiatives would reduce the immediate threats from nuclear weapons, lower nuclear tensions around the world, and help push the Doomsday Clock away from midnight.

A troubling climate outlook

Record-breaking climate trends continued in 2024 and 2025. Globally averaged temperature in 2024 was at the warmest level in 175 years of record-keeping. Likewise, atmospheric carbon dioxide—the greenhouse gas most responsible for human-caused climate change—reached a new high of 152 percent of 1750 levels. The oceans continue to absorb about 90 percent of the heat added by climate change, and globally averaged sea surface temperatures are the warmest in the modern satellite and buoy record. The Conejeres Glacier in Colombia was declared extinct, and all glaciers in Venezuela have joined a long list of glaciers that are endangered or have disappeared. With the addition of freshwater from melting glaciers and thermal expansion, global averaged sea level rise reached the highest level in the satellite record of sea level, which began in 1993.

The hydrologic cycle, energized by the warm temperatures, became erratic, with deluges and droughts hopscotching around the globe. Large swaths of Peru, the Amazon, southern Africa, and northwest Africa experienced droughts, while the state of Rio Grande do Sul in southeast Brazil received record rainfall, and extensive floods occurred in Congo River Basin. Parts of Asia and Central Europe were also wetter than normal while Canada experienced both its hottest and driest year on record. "An estimated 3.6 billion people face inadequate access to water at least one month per year and this is expected to increase to more than 5 billion by 2050," according to the UN, and the world is falling far short of the UN Sustainable Development Goal set for water and sanitation.

There were over 60,000 heat-related deaths in the summer heatwave in Europe. Floods in the Congo displaced 350,000 people. The deluge at Rio Grande do Sul displaced over half a million people. In the United States, the number of severe climate disasters increased nearly five-fold in 2024, compared to the 1990-2000 decade. Furthermore, the average time between these severe disasters is just 12 days, compared to an average of 82 days in the early 1980s.

Total carbon dioxide emissions—the sum of fossil fuel and land-use change emissions—continued to increase in the decade 2014-2023, albeit more slowly than in the preceding decade. The global average concentration of carbon dioxide in 2024 was 3.5 parts per million higher than in 2023, which is the largest annual increase since modern measurements started in 1957. There also is concern that terrestrial and ocean carbon dioxide sinks that absorb approximately half the fossil and land-use carbon dioxide are becoming less effective. Combustion of coal continues to dominate carbon dioxide emissions, though coal use has plateaued in the most recent decade. Notably, though, China's fossil carbon dioxide greenhouse gas emissions, which accounted for 32 percent of global emissions in 2024, have plateaued and seem likely to fall in the future, given that country's strides in renewable energy.

Renewable energy, especially wind and solar, saw record growth in both capacity and generation in 2024. Renewable capacity approached 4,500 gigawatts, and in 2024, renewable and nuclear energy together surpassed 40 percent of global electricity generation for the first time. Furthermore,

renewables overtook coal's share in the global electricity mix in the first half of 2025.

The goal of the 2025 UN climate summit in Belém, Brazil (COP30) was accelerating climate action and a "just transition" that would support workers and communities moving away from fossil fuels. For the first time in a decision issued in such a forum, though, the Belém text acknowledged the possibility that the world would overshoot the goal of limiting global warming to 1.5 degrees Celsius above preindustrial levels, saying "both the extent and duration of an overshoot need to be limited." The summit also failed to firmly endorse the Intergovernmental Panel on Climate Change (IPCC) as the "best available science" on climate. None of the last three UN climate summits has emphasized phasing out fossil fuels or monitoring emissions.

The UN Environment Programme's "The Emissions Gap Report 2025: Off Target" concludes that full implementation of the targets for national reductions in greenhouse gas emissions put forward at the 2015 climate summit in Paris will allow global temperature to rise by 2.3 to 2.5 degrees Celsius this century, and targets based on current policies will raise temperature by 2.8 degrees. The report further finds that deployment of mitigation strategies remains inadequate, and reliance on carbon dioxide removal to help combat climate change is an uncertain, risky, and costly proposition.

In the United States, the Trump administration's agenda—which seeks to systematically repeal targets and policies, as well as decimate funding for climate change mitigation and science, among other things—is the most aggressive, comprehensive, and consequential climate policy rollback that the authoritative Climate Action Tracker has ever analyzed. The administration has proposed and/or implemented across-the-board halting of carbon dioxide, climate, and environmental data collection and has also threatened to shutter or break up the major climate modeling centers that produce projections critical for developing optimal strategies for climate adaptation and mitigation. The cessation of data collection includes, but is not limited to, the National Oceanic and Atmospheric Administration's iconic carbon dioxide monitoring at the Mauna Loa Observatory in Hawaii; NASA's OCO-2 and OCO-3 satellites, which monitor carbon dioxide from space; and the Environmental Protection Agency's Greenhouse Gas Reporting Program to track industrial and agricultural emissions. The data and information gaps created by the administration's actions, although partially filled by other countries and/or the private sector, will mean that there is limited cross-check on greenhouse gas emitters and hindered projections of future climate. Emission reduction and climate mitigation efforts may now be flying blind.

Reducing the threat of climate catastrophe requires actions both to reduce the cause and to deal with the damage of climate change. First and foremost, come reductions in emissions of greenhouse gases from the burning of fossil fuels to produce energy. Technologies for renewable energy are now mature and cost effective. Governments should ramp up their efforts to widely deploy these clean energy technologies by providing incentives to produce them on a large scale and to create markets for them. Equally important in the fight against climate change is renewed reliance on science that tracks and guides emission reduction and mitigation efforts. This return to science-based climate policy includes the collection, validation, and sharing of climate and greenhouse gas information around the world, as well as the enhancement of model projections of climate impacts on the wellbeing of all inhabitants of the planet.

The biosecurity outlook: four major concerns

Four substantive developments in the past year have elevated concerns about risks associated with the life sciences: the recognition of a potential existential threat to all life on Earth from the laboratory synthesis of self-replicating, so-called "mirror life"; accelerating evolution of artificial intelligence tools that can be used to design new biological threats and provide easier access to previously developed biological agents; continuing concerns about state-sponsored offensive biological weapons programs in a world of diminished norms and constraints on the exercise of power; and the rapid dismantling and degradation of US public health infrastructure, expertise, and capacity during the past year, coupled with the loss of trust in public health authorities and science—in the face of looming infectious disease threats such as avian influenza. The net effect of these developments is to leave Americans and others around the world at greater risk of harm from biological threats.

All life is composed of molecules that can exist in one of two different mirror-image configurations, just like left and right hands. This property of "handedness" is also called chirality. Most life on Earth uses biological molecules of the same chirality (e.g., sugars and nucleic acids are R-handed, amino acids are L-handed) and has evolved such that these molecules fit together and interact like a hand in a glove. Scientists beginning with Louis Pasteur have speculated about the possibility of mirror life, that is, cells and organisms composed entirely of biomolecules with the opposite chirality from that observed on Earth and have wondered why it apparently did not arise on this planet.

During the last decade, a handful of scientists have proposed synthesizing mirror life in the laboratory. They were motivated largely by curiosity and challenge and encouraged by technical advances in chemical synthesis of mirror-image versions of many key biomolecules that can be used to build and "boot up" mirror cells, as well as by progress towards the design and assembly of synthetic cells with natural chirality. In late 2024, 38 scientists from 9 countries published a detailed assessment of the risks of mirror life, arriving at a surprising set of conclusions: A mirror cell could find sufficient nutrients to grow in many habitats, including in humans, other animals, plants, and the environment; a mirror cell could plausibly evade normal controls on growth because of resistance to predation and immune control; and unchecked growth of a mirror cell could lead to widespread disruption and damage to most ecosystems, eventual widespread death of humans, other animals, and plants, and a potential existential risk to all life on Earth. These scientists urged that in the absence of compelling evidence that mirror life would not produce catastrophic results on Earth, the research community should not create mirror bacteria and other mirror cells.

Other scientists and policymakers in 2025 endorsed these findings and conclusions. Issues that remain unresolved include how to prevent the creation of mirror life without impeding other work in synthetic biology; which national and international governance mechanisms are best suited for managing the risks of mirror life; how to address questions about the possible need for detection, diagnostics, treatments, and preventive

measures; and the most effective mechanisms for multilateral engagement.

Applications of large language models to biology and biological design tools grew exponentially in power and capability over the past year. Developments included more powerful AI tools that enable the design of new proteins—both beneficial and harmful—and genome language models that can design novel functional viruses. Because there are few safeguards against misuse of these tools and because the element of surprise strongly favors malicious actors, the risk of harm from misuse of AI tools has increased over the past year. Unfortunately, there are few if any incentives for the private sector to prioritize guardrails and AI safety measures, especially under current US political leadership.

During the past year—which marked the 50th anniversary of the Biological and Toxin Weapons Convention (BWC)—there were no meaningful measures to strengthen international control regimes against the development of biological weapons by states parties to the convention. On the contrary, the withdrawal of the United States from international engagement on this issue, the US failure to call out egregious violations of international law and norms by Russia, and China's lack of transparency on biological research may have increased the likelihood that more resources will be devoted to the design, development, and possible deployment of biological weapons.

In the wake of the COVID-19 pandemic and political blow-back against governmental efforts to manage it, and with the dramatic change in US political leadership in January 2025, US pandemic preparedness and public health infrastructure have suffered major blows. Severe damage has arrived in multiple forms: severe cuts in funding for basic and applied public health research; reduced funding for non-commercially available biological countermeasure development and stockpiles; discontinuation of international, national, and local biosurveillance activities, leading to a loss of situational awareness; and reductions in US public health workforce and infrastructure support at the national and local levels. Damage has been amplified by an accelerating loss of trust in science, in public health interventions such as vaccines, and in public health authorities. The damage to US public health infrastructure has already caused strong, harmful secondary and tertiary effects around the world, none of which will be easily reversed.

All of this takes place against a backdrop of continued emergence and evolution of infectious disease threats such as avian influenza. Many public health and health security experts are convinced that the ability of the United States and others around the world to respond effectively to a new biological threat, regardless of origin, has been substantially degraded over the past year. This places millions more at increased risk of illness and death.

The heightened risks associated with these four developments could be mitigated by the adoption of multilateral agreements and national regulations to prevent the creation of mirror life; by cooperation between government and industry to impose meaningful measures for reducing the prospect that AI be used to create biological threats; by international engagement, especially by the United States, Russia, and China to re-affirm and strengthen the Biological Weapons Convention; and by restoring support for public health research, infrastructure, surveillance, prevention, and response capabilities to 2024 levels and by building upon this baseline to create a more anticipatory and resilient biodefense.

Disruptive technologies: a wide array of potential threats

Artificial intelligence continues to be a significant and disruptive technology. Investments in, and applications of, this technology continue to grow rapidly. The sophistication of large language models (LLMs) and their applications in critical processes, coupled with lingering concerns about their accuracy and tendency to "hallucinate," have generated significant public debate about potential risks.

In science, AI has played a role in several important discoveries, including more-accurate-than-ever-before predictions of the structure and interactions of proteins, nucleic acids, small molecules, ions, and modified residues that have biological significance. Some researchers are concerned that AI will be employed in the design of unique new pathogens.

For defense applications, AI is increasingly applied to command and control, operational planning, logistics, autonomous systems, cybersecurity, and digital forensics, as well as modernizing core business operations. While logistics and planning applications are relatively benign, command and control applications may be problematic, especially in decisions to employ weapons, and especially in nuclear command and control. The head of the US Strategic Command recently stated that, while a human will always make the final decision on the use of nuclear weapons, it is conceivable that AI will be embedded in decision-support systems used for nuclear weapons. Even if a human is always in the decision loop, a too-heavy dependence on black-box systems could present a serious danger.

At the same time it is rushing to apply AI technology, the current US administration revoked a previous executive order on AI safety, reflecting a prioritization of AI innovation over safety and risk management that is mirrored in other major powers. Over the last year, the European Union's AI act came into force, and the impact of that act is beginning to unfold, though the EU is under pressure from the US government and AI industry lobbyists to delay or roll back some of the act's regulations.

Increasing chaos, disorder, and dysfunction in the world's information ecosystem threaten society's capacity to address difficult challenges, and it is clear that AI has great potential to accelerate these processes of information corruption. AI-enabled distortion of the information environment will likely remain an important obstacle to effective efforts to deal with urgent major threats like nuclear war, pandemics, and climate change. Large language model technologies and dramatic improvements in the phony video depictions known as deepfakes will have consequential future effects on the information ecosystem unless controls are introduced. Appropriate governance of AI and social media platforms is essential to an information ecosystem that supports truth and democracy; however, many media platforms are pulling back on commitments to moderate content and are reluctant to challenge incumbent political actors for fear of retaliation.

Indeed, in the United States formerly de-platformed purveyors of disinformation are now in positions of political authority and feel no qualms about exercising the powers of their new positions to push discredited narratives

and pursue political enemies. The United States now has a president who personally participates in distributing fake information, most recently distributing AI-generated videos announcing a new health care concept—the medbed—that is a conspiracy theory based on false beliefs about UFOs. Both Russia and China have used such "deepfakes" and social media in their own wide-ranging disinformation campaigns.

In the United States, the scientific base out of which disruptive technologies emerge is under unprecedented attack, with arbitrary, ignorance-driven, meat-ax budget cuts and rescissions in research funding, attacks on the research infrastructure in universities, restrictions on public dissemination of vital data in areas relevant to climate change and public health, and prohibitions on government scientists publishing in the global scientific literature.

There is a growing belligerence among the United States, Russia, and China in space, and the probability of conflict in space continues to grow. China and Russia are far more active now than in previous decades, and US activities, both governmental and private, make it difficult to avert a military space race. The use of space systems—including privately owned Starlink satellites—to support military operations continues to expand. As a result, satellites—owned both by governments and corporations—become ever more important as military targets.

The Trump administration has announced plans for a nationwide "Golden Dome" defense against strategic ballistic missiles—essentially round two of the long-abandoned Reagan-era Strategic Defense Initiative, complete with space-based interceptors for boost-phase intercept of intercontinental ballistic missiles. Advocates argue that the technology context has changed dramatically since the 1980s, especially with respect to reduced space-launch costs and improvements in sensor technologies. However, as before, missile defense systems are at best only partially effective and serve as a provocation for the other side to invest in greater offensive capability. The danger is that Golden Dome will result in little real defense but will contribute to a deepening and dangerous arms race that extends to outer space. US Space Force leadership is now talking about space-based interceptors not only in terms of missile defense but also as elements of how the United States would conduct combat in space. At the same time, Russia and China appear to be contemplating the placement of nuclear weapons in space.

Science and Security Board Biographies

Alexandra Bell (*ex officio*) is the president and CEO of the *Bulletin of the Atomic Scientists*. Before joining the *Bulletin*, Bell served as the Deputy Assistant Secretary for Nuclear Affairs in the Bureau of Arms Control, Deterrence, and Stability at the US State Department, where she managed the Offices of Strategic Stability and Deterrence and Multilateral and Nuclear Affairs. From 2017 to 2021, Bell was the Senior Policy Director at the Center for Arms Control and Non-Proliferation and the Council for a Livable World. Previously, Bell served as a Senior Advisor in the Office of the Under Secretary of State for Arms Control and International Security and as an Advisor in ADS, then named the Bureau of Arms Control, Verification and Compliance. Before joining the State Department in 2010, she worked on nuclear policy issues at the Ploughshares Fund and the Center for American Progress. Bell received a Master's degree in International Affairs from the New School and a Bachelor's degree in Peace, War and Defense from the University of North Carolina at Chapel Hill. From 2001-2003, she was a Peace Corps Volunteer in Saint Elizabeth, Jamaica. Bell is a Member of the Council on Foreign Relations.

Edmund G Brown Jr. (Executive Chair) completed his fourth term as Governor of the State of California in 2019. He began his career in public service in 1969 as a trustee for the LA Community College District and became California Secretary of State in 1970 and Governor of California in 1974 and 1978. After his governorship, Brown lectured and traveled widely, practiced law, served as chairman of the state Democratic Party, and ran for president. Brown was elected Mayor of Oakland in 1998 and California Attorney General in 2006; he was elected to a third gubernatorial term in 2010 and a fourth term in 2014. During this time, Brown helped eliminate the state's multi-billion budget deficit, spearheaded successful campaigns to provide new funding for California's schools, and established a robust Rainy Day Fund to prepare for the next economic downturn. His administration established nation-leading targets to protect the environment and fight climate change. Brown attended the University of California, Berkeley, and earned a JD at Yale Law School.

Steve Fetter is a 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. He is a fellow of the American Physical Society and a member of the Union of Concerned Scientists board of directors and the National Academy of Sciences Committee on International Security and Arms Control. He has worked on nuclear policy issues in the Pentagon and the State Department and has been a visiting fellow at Stanford, Harvard, MIT, and Lawrence Livermore National Laboratory. He also served as associate director of the Joint Global Change Research Institute and vice chairman of the Federation of American Scientists. He is a recipient of the American Physical Society's Joseph A. Burton Forum Award, the Federation of American Scientists' Hans Bethe 'Science in the Public Service' award, and the Secretary of Defense Medal for Outstanding Public Service.

Inez Fung is a Professor Emerita of Atmospheric Science in the Department of Earth and Planetary Science and the Department of Environmental Science, Policy and Management at the University of California, Berkeley. She pioneered the use of global three-dimensional models of atmospheric circulation to infer carbon sources and sinks at the surface. She was the US lead for the 2014 joint NAS-Royal Society study "Climate Change: Evidence and Causes" and its 2020 update. Fung is a member of the US National Academy of Sciences; a foreign member of the Royal Society, London; and a member of Academia Sinica (Taiwan). Among her other honors are the Roger Revelle Medal from the American Geophysical Union and the C.G. Rossby Research Medal from the American Meteorological Society.

Asha M. George is the executive director of the Bipartisan Commission on Biodefense at the Atlantic Council. She is a public health security professional whose research and programmatic emphasis has been practical, academic, and political. George served in the US House of Representatives as a senior professional staffer and subcommittee staff director at the House Committee on Homeland Security in the 110th and 111th Congress. She has worked for a variety of organizations, including government contractors, foundations, and non-profits. As a contractor, she supported and worked with all federal Departments, especially the Department of Homeland Security and the Department of Health and Human Services. George also served on active duty in the US Army as a military intelligence officer and as a paratrooper. She is a decorated Desert Storm Veteran.

Biographies (cont.)

She holds a Bachelor of Arts in Natural Sciences from Johns Hopkins University, a Master of Science in Public Health from the University of North Carolina at Chapel Hill, and a Doctorate in Public Health from the University of Hawaii at Manoa. She is also a graduate of the Harvard University National Preparedness Leadership Initiative.

Alexander Glaser is an associate professor in the School of Public and International Affairs and in the Department of Mechanical and Aerospace Engineering at Princeton University. Glaser has co-directed Princeton's Program on Science and Global Security since 2016. Along with Harold Feiveson, Zia Mian, and Frank von Hippel, he is co-author of Unmaking the Bomb (MIT Press, 2014). For Princeton's work on nuclear warhead verification, *Foreign Policy* magazine selected him as one of the 100 Leading Global Thinkers of 2014. In September 2020, Glaser was elected a Fellow of the American Physical Society for "advancing the scientific and technical basis for nuclear arms control, nonproliferation, and disarmament verification." Along with Tamara Patton and Susanna Pollack, he is one of the executive producers of the VR documentary On the Morning You Wake. Glaser holds a PhD in Physics from Darmstadt University, Germany.

Daniel Holz (Chair) is a professor at the University of Chicago in the Departments of Physics, Astronomy & Astrophysics, the Enrico Fermi Institute, and the Kavli Institute for Cosmological Physics. His research focuses on general relativity in the context of astrophysics and cosmology. He is a member of the Laser Interferometer Gravitational-Wave Observatory (LIGO) collaboration and was part of the team that announced the first detection of gravitational waves in early 2016 and the first multi-messenger detection of a binary neutron star in 2017. Holz is also founding director of the University of Chicago Existential Risk Laboratory (XLab). He received a 2012 National Science Foundation CAREER Award, the 2015 Quantrell Award for Excellence in Undergraduate Teaching, and the Breakthrough Prize in Fundamental Physics in 2016. Holz was selected as a Kavli Fellow of the National Academy of Sciences and is a Fellow of the American Physical Society. He received his PhD in physics from the University of Chicago and his AB in physics from Princeton University. As chair of the Science and Security Board, Holz is a member of the Governing Board, *ex officio*.

Jill Hruby served as the Under Secretary for Nuclear Security at the Department of Energy and Administrator of the National Nuclear Security Administration from July 2021 to January 2025. Prior to being a political appointee, Hruby had a 34-year career at Sandia National Laboratories retiring in 2017 as the Laboratories Director. From 2018-2021, she worked at the Nuclear Threat Initiative as the inaugural Sam Nunn Distinguished Fellow and a non-resident Distinguished Fellow. She is a member of the National Academy of Engineering and serves on the Committee for International Security and Arms Control. She is an advisory governor for the Lawrence Livermore Executive Board. She has served on the Defense Science Board, and many technical advisory committees and non-profit organization boards. Hruby has received the Department of Energy Secretary's Exceptional Service Award, the National Nuclear Security Administrator's Distinguished Service Gold Award, and Office of the Secretary of Defense Medal for Exceptional Public Service.

David Kuhlman (*ex officio*) is a partner at Lotis Blue Consulting (formerly Axiom Consulting Partners), a consulting firm that helps clients identify pathways to profitable growth and align their organizations for long-term success. For over 30 years, he has worked with people-intensive/asset-light businesses including accounting and law firms to establish and realize transformative strategies. Previously, Kuhlman was managing partner of Sibson Consulting, a leading HR consultancy and global head of Human Resources for Russell Reynolds Associates, a premier executive recruiting firm. As chair of the Governing Board, Kuhlman is a member of the Science and Security Board, *ex officio*, but does not set the Doomsday Clock.

Robert Latiff is an adjunct professor at the University of Notre Dame. He retired from the US Air Force as a major general in 2006. General Latiff was a member of the National Academy of Sciences Committee on Transformative Science and Technology for the Department of Defense. Latiff is the author of *Future Peace: Technology, Aggression, and the Rush to War*, which looks at the role technology plays in leading us into conflict. He is also the author of *Future War: Preparing for the New Global Battlefield*.

Biographies (cont.)

Melanie Mitchell received a PhD in Computer Science from the University of Michigan in 1990, and has held faculty or research positions at the University of Michigan, the Santa Fe Institute, Los Alamos National Laboratory, the Oregon Graduate Institute, and Portland State University. She is currently Professor at the Santa Fe Institute. Her recent research focuses on conceptual abstraction and analogy-making in humans and in artificial intelligence systems. Mitchell is the author or editor of six books and over 100 scholarly papers in the fields of artificial intelligence, cognitive science, and complex systems. Her 2009 book *Complexity: A Guided Tour* (Oxford University Press) won the 2010 Phi Beta Kappa Science Book Award, and her 2019 book *Artificial Intelligence: A Guide for Thinking Humans* (Farrar, Straus, and Giroux) was shortlisted for the 2023 Cosmos Prize for Scientific Writing. Mitchell is the recipient of the Senior Scientific Award from the Complex Systems Society, the Distinguished Cognitive Scientist Award from UC Merced, and the Herbert A. Simon Award of the International Conference on Complex Systems.

David Relman is the Thomas C. and Joan M. Merigan Professor in Medicine, Professor of Microbiology & Immunology, and Senior Fellow at the Center for International Security and Cooperation at Stanford University. Relman was an early pioneer in the modern study of the human indigenous microbiota (microbiome). His current research work focuses on assembly, diversity, stability, and resilience of human microbial communities. He served as President of the Infectious Diseases Society of America. Among policy-relevant activities in biological security and emerging infections, Relman was a founding member of the National Science Advisory Board on Biosecurity and of the Intelligence Community Studies Board at the U.S. National Academies of Science, Engineering, and Medicine, and serves on the Defense Science Board at the U.S. Department of Defense. He is a member of the National Academy of Medicine and a Member of the American Academy of Arts & Sciences. From May 2024 to January 2025, he served as Senior Advisor in the Office of Pandemic Preparedness and Response policy at The White House.

Scott Sagan is the Caroline S.G. Munro Professor of Political Science, the Mimi and Peter Haas University Fellow in Undergraduate Education, Co-Director and Senior Fellow at the Center for International Security and Cooperation, and Senior Fellow at the Freeman Spogli Institute at Stanford University. He also serves as Chairman of the American Academy of Arts and Sciences' Committee on International Security Studies. Before joining the Stanford faculty, Sagan was a lecturer in the Department of Government at Harvard University and served as special assistant to the director of the Organization of the Joint Chiefs of Staff in the Pentagon. Sagan has also served as a consultant to the office of the Secretary of Defense and at the Sandia National Laboratory and the Los Alamos National Laboratory.

Ambuj Sagar is the deputy director (strategy & planning) and the Vipula and Mahesh Chaturvedi Professor of Policy Studies at the Indian Institute of Technology (IIT) Delhi. He previously served as the founding head of the School of Public Policy at IIT Delhi. Sagar's research interests broadly lie at the intersection of science, technology, and sustainable development. Sagar was a lead author in Working Group III of the IPCC's Sixth Assessment Report, a member of the Independent Group of Scientists appointed by the UN Secretary-General to prepare the Global Sustainable Development Report 2023, and a member of the NAS panel that authored the 2021 report on geoengineering research and governance. He has served as a respected advisor to various Indian government agencies as well as many multilateral and bilateral agencies.

Manpreet Sethi is a distinguished fellow at the Centre for Air Power Studies in New Delhi where she heads its program on nuclear issues. She is also a Senior Research Advisor at the Asia Pacific Leadership Network. Since receiving her doctorate in 1997, she has worked on nuclear energy, strategy, missile defense, arms control, nuclear risk reduction, and disarmament. Over 130 papers have been written, and nine books authored, co-authored, or edited by Sethi. She lectures at the National Defence College and other establishments of the Indian Armed Forces, Police, Foreign Services, and Universities. She is co-chair of the Working Group on Reducing Pathways to Nuclear Use at Harvard University's Belfer Center and co-chair of Women in Nuclear–India. She is a Board Member of the Missile Dialogue Initiative, IISS. She is the recipient of the K Subrahmanyam Award (2014), Commendation by Chief of Air Staff (2020), and Commendation by Commander-in-Chief, Strategic Forces Command (2022). She is a member of the International Group of Eminent Persons selected by Japan's Prime Minister to explore possibilities of nuclear elimination.

Robert Socolow is professor emeritus in the Department of Mechanical and Aerospace Engineering at Princeton University. He currently serves on the National Academy of Sciences Advisory Committee to the US Global Change Research Program. From 2000 to 2019, he and Steve Pacala were the co-principal investigators of Princeton's Carbon Mitigation Initiative, a twenty-five-year (2001-2025) project supported by BP. His best-known paper, with Pacala, was in *Science* (2004): "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies." Socolow is a member of the American Academy of Arts and Sciences, an associate of the National Research Council of the National Academies, a fellow of the American Physical Society, and a fellow of the American Association for the Advancement of Science. His awards include the 2009 Frank Kreith Energy Award from the American Society of Mechanical Engineers and the 2005 Axelson Johnson Commemorative Lecture award from the Royal Academy of Engineering Sciences of Sweden (IVA). In 2003 he received the Leo Szilard Lectureship Award from the American Physical Society.

Jon Wolfsthal is the director of global risk at the Federation of American Scientists and a senior adjunct fellow at the Center for a New American Security. He was appointed to the US Department of State's International Security Advisory Board in 2022. He served previously as senior advisor to Global Zero in Washington, DC. Before 2017, Wolfsthal served as Special Assistant to President of the United States Barack Obama for National Security Affairs and is a former senior director at the National Security Council for arms control and nonproliferation. He also served from 2009-2012 as Special Advisor to Vice President Joseph R. Biden for nuclear security and nonproliferation and as a director for nonproliferation on the National Security Council. During his government service, Wolfsthal has been involved in almost every aspect of US nuclear weapons, deterrence, arms control, and nonproliferation policy.

Editor

John Mecklin is the editor-in-chief of the *Bulletin of the Atomic Scientists*. Previously, he was the top editor of *Miller-McCune* (subsequently known as *Pacific Standard*), *High Country News*, and three other magazines. Outside the publications he has led, Mecklin's writing has appeared in *Foreign Policy* magazine, the *Columbia Journalism Review*, and the Reuters news wire, among other publications. Writers working at his direction have won many major journalism contests, including the George Polk Award. Mecklin holds a master in public administration degree from Harvard's Kennedy School of Government.

About the *Bulletin of the Atomic Scientists*

At our core, the *Bulletin of the Atomic Scientists* is a media organization, publishing a free-access website and a bimonthly magazine. But we are much more. The *Bulletin*'s website, iconic Doomsday Clock, and regular events equip the public, policy makers, and scientists with the information needed to reduce man-made threats to our existence. The *Bulletin* focuses on three main areas: nuclear risk, climate change, and disruptive technologies, including developments in biotechnology. What connects these topics is a driving belief that because humans created them, we can control them.

The *Bulletin* is an independent, nonprofit 501(c)(3) organization. We gather the most informed and influential voices tracking man-made threats and bring their innovative thinking to a global audience. We apply intellectual rigor to the conversation and do not shrink from alarming truths.

The *Bulletin* has many audiences: the general public, which will ultimately benefit or suffer from scientific breakthroughs; policy makers, whose duty is to harness those breakthroughs for good; and the scientists themselves, who produce those technological advances and thus bear a special responsibility. Our community is international, with more than half of our website visitors coming from outside the United States. It is also young. Half are under the age of 35.

To learn more, visit our website:

https://thebulletin.org

Timeline of the Doomsday Clock

IT IS 85 SECONDS TO MIDNIGHT

Russia, China, the United States, and other major countries have become increasingly aggressive, adversarial, and nationalistic. Hard-won global understandings are collapsing, accelerating a winner-takes-all great power competition and undermining the international cooperation critical to reducing existential risks. Far too many leaders have grown complacent and indifferent, in many cases adopting rhetoric and policies that accelerate rather than mitigate those risks. Because of this failure of leadership, the *Bulletin*'s Science and Security Board sets the Doomsday Clock at 85 seconds to midnight, the closest it has ever been to catastrophe.

IT IS 89 SECONDS TO MIDNIGHT

In setting the Clock one second closer to midnight, the Science and Security Board sends a stark signal: Because the world is already perilously close to the precipice, a move of even a single second should be taken as an indication of extreme danger and an unmistakable warning that every second of delay in reversing course increases the probability of global disaster.

IT IS STILL 90 SECONDS TO MIDNIGHT

The Doomsday Clock remains at 90 seconds to midnight because humanity continues to face an unprecedented level of danger. The decision should not be taken as a sign that the international security situation has eased. Instead, leaders and citizens around the world should take this statement as a stark warning and respond urgently, as if today were the most dangerous moment in modern history. Because it may well be.

IT IS 90 SECONDS TO MIDNIGHT

The Science and Security Board moves the hands of the Doomsday Clock forward, largely (though not exclusively) because of the mounting dangers of the war in Ukraine. The war has raised profound questions about how states interact, eroding norms of international conduct that underpin successful responses to a variety of global risks. The Clock now stands at 90 seconds to midnight—the closest to global catastrophe it has ever been.

IT IS STILL 100 SECONDS TO MIDNIGHT

Leaders around the world must immediately commit themselves to renewed cooperation in the many ways and venues available for reducing existential risk. Citizens of the world can and should organize to demand that their leaders do so—and quickly. The doorstep of doom is no place to loiter.

IT IS STILL 100 SECONDS TO MIDNIGHT

If humanity is to avoid an existential catastrophe—one that would dwarf anything it has yet seen—national leaders must do a far better job of countering disinformation, heeding science, and cooperating to diminish global risks. Citizens around the world can and should organize and demand—through public protests, at ballot boxes, and in other creative ways—that their governments reorder their priorities and cooperate domestically and internationally to reduce the risk of nuclear war, climate change, and other global disasters, including pandemic disease.

IT IS 100 SECONDS TO MIDNIGHT

Humanity continues to face two simultaneous existential dangers—nuclear war and climate change—that are compounded by a threat multiplier, cyber-enabled information warfare, that undercuts society's ability to respond. Faced with this daunting threat landscape and a new willingness of political leaders to reject the negotiations and institutions that can protect civilization over the long term, the Science and Security Board moved the Doomsday Clock 20 seconds closer to midnight—a warning to leaders and citizens around the world that the international security situation is now more dangerous than it has ever been, even at the height of the Cold War.

IT IS STILL 2 MINUTES TO MIDNIGHT

The "new abnormal" that the world now inhabits is unsustainable and extremely dangerous. It is two minutes to midnight, but there is no reason the Doomsday Clock cannot move away from catastrophe. It has done so in the past, because wise leaders acted—under pressure from informed and engaged citizens around the world. Today, citizens in every country can insist on facts, and discount nonsense. They can demand action to reduce the existential threat of nuclear war and unchecked climate change. Given the inaction of their leaders to date, citizens of the world should make a loud and clear demand: #RewindTheDoomsdayClock.

IT IS 2 MINUTES TO MIDNIGHT

The failure of world leaders to address the largest threats to humanity's future is lamentable—but that failure can be reversed. The world has seen the threat posed by the misuse of information technology and witnessed the vulnerability of democracies to disinformation. But there is a flip side to the abuse of social media. Leaders react when citizens insist they do so, and citizens around the world can use the power of the internet to improve the long-term prospects of their children and grandchildren. They can seize the opportunity to make a safer and saner world.

Timeline (cont.)

IT IS TWO AND A HALF MINUTES TO MIDNIGHT

In its two most recent annual announcements on the Clock, the Science and Security Board warned: "The probability of global catastrophe is very high, and the actions needed to reduce the risks of disaster must be taken very soon." In 2017, we find the danger to be even greater, the need for action more urgent. Wise public officials should act immediately, guiding humanity away from the brink. If they do not, wise citizens must step forward and lead the way.

IT IS STILL 3 MINUTES TO MIDNIGHT

"Last year, the Science and Security Board moved the Doomsday Clock forward to three minutes to midnight, noting: 'The probability of global catastrophe is very high, and the actions needed to reduce the risks of disaster must be taken very soon.' That probability has not been reduced. The Clock ticks. Global danger looms. Wise leaders should act—immediately."

IT IS 3 MINUTES TO MIDNIGHT

"Unchecked climate change, global nuclear weapons modernizations, and outsized nuclear weapons arsenals pose extraordinary and undeniable threats to the continued existence of humanity." Despite some modestly positive developments in the climate change arena, current efforts are entirely insufficient to prevent a catastrophic warming of Earth. Meanwhile, the United States and Russia have embarked on massive programs to modernize their nuclear triads—thereby undermining existing nuclear weapons treaties. "The clock ticks now at just three minutes to midnight because international leaders are failing to perform their most important duty—ensuring and preserving the health and vitality of human civilization."

IT IS 5 MINUTES TO MIDNIGHT

"The challenges to rid the world of nuclear weapons, harness nuclear power, and meet the nearly inexorable climate disruptions from global warming are complex and interconnected. In the face of such complex problems, it is difficult to see where the capacity lies to address these challenges." Political processes seem wholly inadequate; the potential for nuclear weapons use in regional conflicts in the Middle East, Northeast Asia, and South Asia are alarming; safer nuclear reactor designs need to be developed and built, and more stringent oversight, training, and attention are needed to prevent future disasters; the pace of technological solutions to address climate change may not be adequate to meet the hardships that large-scale disruption of the climate portends.

IT IS 6 MINUTES TO MIDNIGHT

International cooperation rules the day. Talks for a follow-on to the Strategic Arms Reduction Treaty are nearly complete, and negotiations for further reductions in the US and Russian nuclear arsenals are planned. Barack Obama becomes the first US president to publicly call for a nuclear-weapon-free world. Dangers posed by climate change are still great, but there are pockets of progress. At Copenhagen, the developing and industrialized countries agree to take responsibility for carbon emissions and to limit global temperature rise to 2 degrees Celsius.

IT IS 5 MINUTES TO MIDNIGHT

The world stands at the brink of a second nuclear age. The United States and Russia remain ready to stage a nuclear attack within minutes, North Korea conducts a nuclear test, and many in the international community worry that Iran plans to acquire the Bomb. Climate change also presents a dire challenge to humanity. Damage to ecosystems is already taking place; flooding, destructive storms, increased drought, and polar ice melt are causing loss of life and property.

IT IS 7 MINUTES TO MIDNIGHT

Concerns regarding a nuclear terrorist attack underscore the enormous amount of unsecured—and sometimes unaccounted for—weapon-grade nuclear materials located throughout the world. Meanwhile, the United States expresses a desire to design new nuclear weapons, with an emphasis on those able to destroy hardened and deeply buried targets. It also rejects a series of arms control treaties and announces it will withdraw from the Anti-Ballistic Missile Treaty.

IT IS 9 MINUTES TO MIDNIGHT

India and Pakistan stage nuclear weapons tests only three weeks apart. "The tests are a symptom of the failure of the international community to fully commit itself to control the spread of nuclear weapons—and to work toward substantial reductions in the numbers of these weapons," a dismayed *Bulletin* reports. Russia and the United States continue to serve as poor examples to the rest of the world. Together, they still maintain 7,000 warheads ready to fire at each other within 15 minutes.

IT IS 14 MINUTES TO MIDNIGHT

Hopes for a large post-Cold War peace dividend and a renouncing of nuclear weapons fade. Particularly in the United States, hard-liners seem reluctant to soften their rhetoric or actions, as they claim that a resurgent Russia could provide as much of a threat as the Soviet Union. Such talk slows the rollback in global nuclear

Timeline (cont.)

forces; more than 40,000 nuclear weapons remain worldwide. There is also concern that terrorists could exploit poorly secured nuclear facilities in the former Soviet Union.

IT IS 17 MINUTES TO MIDNIGHT

With the Cold War officially over, the United States and Russia begin making deep cuts to their nuclear arsenals. The Strategic Arms Reduction Treaty greatly reduces the number of strategic nuclear weapons deployed by the two former adversaries. Better still, a series of unilateral initiatives remove most of the intercontinental ballistic missiles and bombers in both countries from hair-trigger alert. "The illusion that tens of thousands of nuclear weapons are a guarantor of national security has been stripped away," the *Bulletin* declares.

IT IS 10 MINUTES TO MIDNIGHT

As one Eastern European country after another (Poland, Czechoslovakia, Hungary, Romania) frees itself from Soviet control, Soviet General Secretary Mikhail Gorbachev refuses to intervene, halting the ideological battle for Europe and significantly diminishing the risk of all-out nuclear war. In late 1989, the Berlin Wall falls, symbolically ending the Cold War. "Forty-four years after Winston Churchill's 'Iron Curtain' speech, the myth of monolithic communism has been shattered for all to see," the *Bulletin* proclaims.

IT IS 6 MINUTES TO MIDNIGHT

The United States and Soviet Union sign the historic Intermediate-Range Nuclear Forces Treaty, the first agreement to actually ban a whole category of nuclear weapons. The leadership shown by President Ronald Reagan and Soviet Premier Mikhail Gorbachev makes the treaty a reality, but public opposition to US nuclear weapons in Western Europe inspires it. For years, such intermediate-range missiles had kept Western Europe in the crosshairs of the two superpowers.

IT IS 3 MINUTES TO MIDNIGHT

US-Soviet relations reach their iciest point in decades. Dialogue between the two superpowers virtually stops. "Every channel of communications has been constricted or shut down; every form of contact has been attenuated or cut off. And arms control negotiations have been reduced to a species of propaganda," a concerned *Bulletin* informs readers. The United States seems to flout the few arms control agreements in place by seeking an expansive, space-based anti-ballistic missile capability, raising worries that a new arms race will begin.

IT IS 4 MINUTES TO MIDNIGHT

The Soviet invasion of Afghanistan hardens the US nuclear posture. Before he leaves office, President Jimmy Carter pulls the United States from the Olympic Games in Moscow and considers ways in which the United States could win a nuclear war. The rhetoric only intensifies with the election of Ronald Reagan as president. Reagan scraps any talk of arms control and proposes that the best way to end the Cold War is for the United States to win it.

IT IS 7 MINUTES TO MIDNIGHT

Thirty-five years after the start of the nuclear age and after some promising disarmament gains, the United States and the Soviet Union still view nuclear weapons as an integral component of their national security. This stalled progress discourages the *Bulletin*: "[The Soviet Union and United States have] been behaving like what may best be described as 'nucleoholics'—drunks who continue to insist that the drink being consumed is positively 'the last one,' but who can always find a good excuse for 'just one more round.'"

IT IS 9 MINUTES TO MIDNIGHT

South Asia gets the Bomb, as India tests its first nuclear device. And any gains in previous arms control agreements seem like a mirage. The United States and Soviet Union appear to be modernizing their nuclear forces, not reducing them. Thanks to the deployment of multiple independently targetable reentry vehicles (MIRVs), both countries can now load their intercontinental ballistic missiles with more nuclear warheads than before.

IT IS 12 MINUTES TO MIDNIGHT

The United States and Soviet Union attempt to curb the race for nuclear superiority by signing the Strategic Arms Limitation Treaty (SALT) and the Anti-Ballistic Missile (ABM) Treaty. The two treaties force a nuclear parity of sorts. SALT limits the number of ballistic missile launchers either country can possess, and the ABM Treaty stops an arms race in defensive weaponry from developing.

IT IS 10 MINUTES TO MIDNIGHT

Nearly all of the world's nations come together to sign the Nuclear Non-Proliferation Treaty. The deal is simple—the nuclear weapon states vow to help the treaty's non-nuclear weapon signatories develop nuclear power if they promise to forego producing nuclear weapons. The nuclear weapon states also pledge to abolish their own arsenals when political conditions allow for it. Although Israel, India, and Pakistan refuse

Timeline (cont.)

to sign the treaty, the *Bulletin* is cautiously optimistic: "The great powers have made the first step. They must proceed without delay to the next one—the dismantling, gradually, of their own oversized military establishments."

1968

IT IS 7 MINUTES TO MIDNIGHT

Regional wars rage. US involvement in Vietnam intensifies, India and Pakistan battle in 1965, and Israel and its Arab neighbors renew hostilities in 1967. Worse yet, France and China develop nuclear weapons to assert themselves as global players. "There is little reason to feel sanguine about the future of our society on the world scale," the *Bulletin* laments. "There is a mass revulsion against war, yes; but no sign of conscious intellectual leadership in a rebellion against the deadly heritage of international anarchy."

1963

IT IS 12 MINUTES TO MIDNIGHT

After a decade of almost nonstop nuclear tests, the United States and Soviet Union sign the Partial Test Ban Treaty, which ends all atmospheric nuclear testing. While it does not outlaw underground testing, the treaty represents progress in at least slowing the arms race. It also signals awareness among the Soviets and United States that they need to work together to prevent nuclear annihilation.

1960

IT IS 7 MINUTES TO MIDNIGHT

Political actions belie the tough talk of "massive retaliation." For the first time, the United States and Soviet Union appear eager to avoid direct confrontation in regional conflicts such as the 1956 Egyptian-Israeli dispute. Joint projects that build trust and constructive dialogue between third parties also quell diplomatic hostilities. Scientists initiate many of these measures, helping establish the International Geophysical Year, a series of coordinated, worldwide scientific observations, and the Pugwash Conferences, which allow Soviet and American scientists to interact.

1953

IT IS 2 MINUTES TO MIDNIGHT

After much debate, the United States decides to pursue the hydrogen bomb, a weapon far more powerful than any atomic bomb. In October 1952, the United States tests its first thermonuclear device, obliterating a Pacific Ocean islet in the process; nine months later, the Soviets test an H-bomb of their own. "The hands of the Clock of Doom have moved again," the *Bulletin* announces. "Only a few more swings of the pendulum, and, from Moscow to Chicago, atomic explosions will strike midnight for Western civilization."

1949

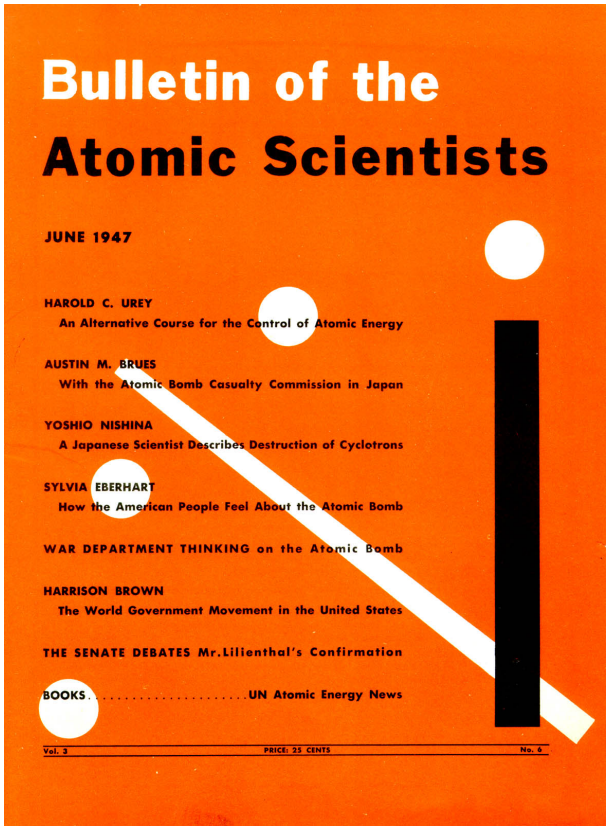
IT IS 3 MINUTES TO MIDNIGHT

The Soviet Union denies it, but in the fall, President Harry Truman tells the American public that the Soviets tested their first nuclear device, officially starting the arms race. "We do not advise Americans that doomsday is near and that they can expect atomic bombs to start falling on their heads a month or year from now," the *Bulletin* explains. "But we think they have reason to be deeply alarmed and to be prepared for grave decisions."

1947

IT IS 7 MINUTES TO MIDNIGHT

As the *Bulletin* evolves from a newsletter into a magazine, the Clock appears on the cover for the first time. It symbolizes the urgency of the nuclear dangers that the magazine's founders—and the broader scientific community—are trying to convey to the public and political leaders around the world.



The Doomsday Clock appeared for the first time on the cover of the Bulletin's *June 1947 issue, set at 7 minutes to midnight.*