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20220307182245798.pdf

Dear Madame Clerk: I enclose herein my three page written testimony with 6 attachments as referenced on page 3 of my written testimony. I ask that for its inclusion in the record and distribution to the Committee. Thank you for your consideration. Robert Watt

HIROSHIMA STREET REMEMBRANCE, BURNSIDE PARK
PROVIDENCE, RHODE ISLAND

<https://youtu.be/pJt2SVEbrJg>

<https://www.facebook.com/TheCoalitionRadio/videos/518417629228305/>

The Church Still Condemns the Nuclear Arms Race



(/uploads/original/20220302-150754-20220103T1430-IN-DEPTH-NUCLEAR-NONPROLIFERATIO-1515032.JPG)

PHOTO: CATHOLIC NEWS SERVICE

Posted Thursday, March 3, 2022 6:00 am

In the Pastoral Constitution on the Church in the Modern World, the fathers of the Second Vatican Council unequivocally condemned the nuclear arms race. They warned political hegemony that an arms race would prove catastrophic for their own civilians. Sadly, their warning was prescient. In his war of aggression against Ukraine, Russian President Vladimir Putin recently threatened the West with punishment "the likes of which one has never seen" should the United States and Europe impose harsher sanctions on his corrupt regime. Putin even ordered the nation's nuclear weapons to engage "high alert" status, thus dangerously escalating the war in the East with fear mongering tactics.

President Biden exercised prudence when he refused to capitulate to Putin's hubris. Portraying an ostensible "inaction" regarding this nuclear threat, Biden spoke forcefully, and with wisdom, when he refused to engage in such dangerous discussion. Engaging the possibility of nuclear force beggars belief in the 21st century. It's also terribly ironic. Such weaponry would ultimately solidify Putin's demise, at the cost of destroying millions of innocent lives in his own country.

The fathers at the Second Vatican Council understood that nuclear weapons do not enshrine peace, even amidst popular "deterrence" theories. They prophetically teach us about the dangers of this hypothesis, noting that "the arms race is an utterly treacherous trap for humanity, and one which ensnares the poor to an intolerable degree" (GS 81). The calculations of war require delicate negotiation, and sometimes require defensive force, no doubt. But the United States cannot engage Putin with his own arrogant rhetoric about the possibility of using nuclear force. The fate of the world depends on it.

Hiroshima – “Original Child Bomb” by Thomas Merton

Current Comment Thomas Merton

"Original Child Bomb" Hiroshima Thomas Merton

In 1961 Thomas Merton published a long prose poem called “Original Child Bomb”.

The title of Merton’s poem is a translation of the name the Japanese gave to the nuclear bomb used against them in Hiroshima.

The poem is based on events leading up to the bombing of Hiroshima on August 6, 1945. Merton said “Original Child Bomb” was an “anti-poem”. It is made up of 41 numbered sections/written in a detached, bureaucratic style. Merton used irony and understatement to emphasize the horror of the events he described.

“Original Child Bomb” was published with the sub-title “Points for meditation to be scratched on the walls of a cave.” Merton seems to suggest here that the bombing of Hiroshima risks returning humanity to the primitive condition of pre-historic cave dwellers.

The 41 sections of the poem contain 2,480 words. But it needs to be read in its entirety. Merton sets a chilling tone with his terse style and his compact use of language. It would not be a bad way to spend a few moments on this August 6, using Merton’s words to reflect on a painful and horrific event in our history.

for a thoughtful introduction to the poem and a powerful recording go
here: <https://thegoldenecho.wordpress.com/2016/08/09/original-child-bomb/>

The author goes to the heart of Merton’s writing and poses some of the troubling questions raised by this

ORIGINAL CHILD BOMB

Points for meditation to be scratched on the walls of a cave

1: In the year 1945 an Original Child was born. The name Original Child was given to it by the Japanese people, who recognized that it was the first of its kind.

2: On April 12th, 1945, Mr. Harry Truman became the President of the United States, which was then fighting the second world war. Mr. Truman was a vice president who became president by accident when his predecessor died of a cerebral hemorrhage. He did not know as much about the war as the president before him did. He knew a lot less about the war than many people did.

About one hour after Mr. Truman became president, his aides told him about a new bomb which was being developed by atomic scientists. They called it the "atomic bomb". They said scientists had been working on it for six years and that it had so far cost two billion dollars. They added that its power was equal to that of twenty thousand tons of TNT. A single bomb could destroy a city. One of those present added, in a reverent tone, that the new explosive might eventually destroy the whole world.

But Admiral Leahy told the president the bomb would never work.

3: President Truman formed a committee of men to tell him if this bomb would work, and if so, what he should do with it. Some members of this committee felt that the bomb would jeopardize the future of civilization. They were against its use. Others wanted it to be used in demonstrations on a forest of cryptomeria trees, but not against a civil or military target. Many atomic scientists warned that the use of atomic power in war would be difficult and even impossible to control. The danger would be very great. Finally, there were others who believed that if the bomb were used just once or twice, on one or two Japanese cities, there would be no more war. They believed the new bomb would product eternal peace.

4: In June 1945 the Japanese government was taking steps to negotiate for peace. On one hand the Japanese ambassador tried to interest the Russian government in acting as a go-between with the United States. On the other hand, an unofficial approach was made secretly through Mr. Allen Dulles in Switzerland. The Russians said they were not interested and that they would not negotiate. Nothing was done about the other proposal which was not official. The Japanese High Command was not in favor of asking for peace, but wanted to continue the war, even if the Japanese mainland were invaded. The generals believed that the war should continue until everybody was dead. The Japanese generals were professional soldiers.

5: In the same month of June, the President's committee decided that the new bomb should be dropped on a Japanese city. This would be a demonstration of the bomb on a civil and military target. As "demonstration" it would be a kind of a "show". "Civilians" all over the world love a good "show". The "destructive" aspect of the bomb would be "military".

6: The same committee also asked if America's friendly ally, the Soviet Union, should be informed of the atomic bomb. Someone suggested that this information would make the Soviet Union even more friendly than it was already. But all finally agreed that the Soviet Union was now friendly enough.

7: There was discussion about which city should be selected as the first target. Some wanted it to be Kyoto, an ancient capital of Japan and a center of the Buddhist religion. Others said no, this would cause bitterness. As a

result of a chance conversation, Mr. Stimson, the Secretary of War, had recently read up on the history and beauties of Kyoto. He insisted that this city should be left untouched. Some wanted Tokyo to be the first target, but others argued that Tokyo had already been practically destroyed by fire raids and could no longer be considered a "target." So it was decided Hiroshima was the most opportune target, as it had not yet been bombed at all. Lucky Hiroshima! What others had experienced over a period of four years would happen to Hiroshima in a single day! Much time would be saved, and "time is money!"

8: When they bombed Hiroshima they would put the following out of business: The Ube Nitrogen Fertilizer Company; the Ube Soda Company; the Nippon Motor Oil Company; the Sumitoma Chemical Company; and most of the inhabitants.

9: At this time some atomic scientists protested again, warning that the use of the bomb in war would tend to make the United States unpopular. But the President's committee was by now fully convinced that the bomb had to be used. Its use would arouse the attention of the Japanese military class and give them food for thought.

10: Admiral Leahy renewed his declaration that the bomb would not explode.

11: On the 4th of July, when the United States in displays of fireworks celebrates its independence from British rule, the British and Americans agreed together that the bomb ought to be used against Japan.

12: On July 7th the Emperor of Japan pleaded with the Soviet Government to act as mediator for peace between Japan and the Allies. Molotov said the question would be "studied." In order to facilitate this "study" Soviet troops in Siberia prepared to attack the Japanese. The Allies had, in any case, been urging Russia to join the war against Japan. However, now that the atomic bomb was nearly ready, some thought it would be better if the Russians took a rest.

13: The time was coming for the new bomb to be tested, in the New Mexico desert. A name was chosen to designate this secret operation. It was called "Trinity".

14: At 5:30 A.M. on July 16th, 1945 a plutonium bomb was successfully exploded in the desert at Almagordo, New Mexico. It was suspended from a hundred foot steel tower which evaporated. There was a fireball a mile wide. The great flash could be seen for a radius of 250 miles. A blind woman miles away said she perceived light. There was a cloud of smoke 40,000 feet high. It was shaped like a toadstool.

15: Many who saw the experiment expressed their satisfaction in religious terms. A semi-official report even quoted a religious book – The New Testament, "Lord, I believe, help thou my unbelief." There was an atmosphere of devotion. It was a great act of faith. They believed the explosion was exceptionally powerful.

16: Admiral Leahy, still a "doubting Thomas," said that the bomb would not explode when dropped from a plane over a city. Others may have had "faith," but he had his own variety of "hope".

17: On July 21st a full written report of the explosion reached President Truman at Potsdam. The report was documented by pictures. President Truman read the report and looked at the pictures before starting out for the conference. When he left his mood was jaunty and his step was light.

18: That afternoon Mr. Stimson called on Mr. Churchill, and laid before him a sheet of paper bearing a code message about the successful test. The message read "Babies satisfactorily born." Mr. Churchill was quick to

realize that there was more in this than met the eye. Mr. Stimson satisfied his legitimate curiosity.

19: On this same day sixty atomic scientists who knew of the test signed a petition that the bomb should not be used against Japan without a convincing warning and an opportunity to surrender.

At this time the U.S.S. Indianapolis, which had left San Francisco on the 18th, was sailing toward the island of Tinian, with some U 235 in a lead bucket. The fissionable material was about the size of a softball, but there was enough for one atomic bomb. Instructions were that if the ship sank, the Uranium was to be saved first, before any life. The mechanism of the bomb was on board the U.S.S. Indianapolis, but it was not yet assembled.

20: On July 26th the Potsdam declaration was issued. An ultimatum was given to Japan: "Surrender unconditionally or be destroyed." Nothing was said about the new bomb. But pamphlets dropped all over Japan threatened "an enormous air bombardment" if the army would not surrender. On July 26th the U.S.S. Indianapolis arrived at Tinian and the bomb was delivered.

21: On July 28th, since the Japanese High Command wished to continue the war, the ultimatum was rejected. A censored version of the ultimatum appeared in the Japanese press with the comment that it was "an attempt to drive a wedge between the military and the Japanese people." But the Emperor continued to hope that the Russians, after "studying" his proposal, would help to negotiate a peace. On July 30th Mr. Stimson revised a draft of the announcement that was to be made after the bomb was dropped on the Japanese target. The statement was much better than the original draft.

22: On August 1st the bomb was assembled in an air-conditioned hut on Tinian. Those who handled the bomb referred to it as "Little Boy". Their care for the Original Child was devoted and tender.

23: On August 2nd President Truman was the guest of His Majesty King George VI on board the H.M.S. Renown in Plymouth Harbor. The atomic bomb was praised. Admiral Leahy, who was present, declared that the bomb would not work. His Majesty George VI offered a small wager to the contrary.

24: On August 2nd a special message from the Japanese Foreign Minister was sent to the Japanese Ambassador in Moscow. "It is requested that further efforts be exerted ... Since the loss of one day may result in a thousand years of regret, it is requested that you immediately have a talk with Molotov." But Molotov did not return from Potsdam until the day the bomb fell.

25: On August 4th the bombing crew on Tinian watched a movie of "Trinity" (the Almagordo Test). August 5th was a Sunday but there was little time for formal worship. They said a quick prayer that the war might end "very soon." On that day, Colonel Tibbetts, who was in command of the B-29 that was to drop the bomb, felt that his bomber ought to have a name. He baptized it Enola Gay, after his mother in Iowa. Col. Tibbetts was a well balanced man, and not sentimental. He did not have a nervous breakdown after the bombing, like some of the other members of his crew.

26: On Sunday afternoon "Little Boy" was brought out in procession and devoutly tucked away in the womb of Enola Gay. That evening few were able to sleep. They were as excited as little boys on Christmas Eve. 27: At 1:37 A.M. August 6th the weather scout plane took off. It was named the Straight Flush, in reference to the mechanical action of a water closet. There was a picture of one, to make this evident.

28: At the last minute before taking off Col. Tibbetts changed the secret radio call sign from "Visitor" to "Dimples." The bombing mission would be a kind of flying smile.

29: At 2:45 A.M. Enola Gay got off the ground with difficulty. Over Iwo Jima she met her escort, two more B-29's, one of which was called the Great Artiste. Together they proceeded to Japan.

30: At 6:40 they climbed to 31,000 feet, the bombing altitude. The sky was clear. It was a perfect morning.

31: At 3:09 they reached Hiroshima and started the bomb run. The city was full of sun. The fliers could see the green grass in the gardens. No fighters rose up to meet them. There was no flak. No one in the city bothered to take cover.

32: The bomb exploded within 100 feet of the aiming point. The fireball was 18,000 feet across. The temperature at the center of the fireball was 100,000,000 degrees. The people who were near the center became nothing. The whole city was blown to bits and the ruins all caught fire instantly everywhere, burning briskly. 70,000 people were killed right away or died within a few hours. Those who did not die right away suffered great pain. Few of them were soldiers.

33: The men in the plane perceived that the raid had been successful, but they thought of the people in the city and they were not perfectly happy. Some felt they had done wrong. But in any case they had obeyed orders. "It was war."

34: Over the radio went the code message that the bomb had been successful: "Visible effects greater than Trinity ... Proceeding to Papacy." Papacy was the code name for Tinian.

35: It took a little while for the rest of Japan to find out what had happened to Hiroshima. Papers were forbidden to publish any news of the new bomb. A four line item said that Hiroshima had been hit by incendiary bombs and added: "It seems that some damage was caused to the city and its vicinity."

36: Then the military governor of the Prefecture of Hiroshima issued a proclamation full of martial spirit. To all the people without hands, without feet, with their faces falling off, with their intestines hanging out, with their whole bodies full of radiation, he declared: "We must not rest a single day in our war effort ... We must bear in mind that the annihilation of the stubborn enemy is our road to revenge." He was a professional soldier.

37: On August 8th Molotov finally summoned the Japanese Ambassador. At last neutral Russia would give an answer to the Emperor's inquiry. Molotov said coldly that the Soviet Union was declaring war on Japan.

38: On August 9th another bomb was dropped on Nagasaki, though Hiroshima was still burning. On August 11th the Emperor overruled his high command and accepted the peace terms dictated at Potsdam. Yet for three days discussion continued, until August 14th the surrender was made public and final.

39: Even then the Soviet troops thought they ought to fight in Manchuria "just a little longer." They felt that even though they could not, at this time, be of help in Japan, it would be worth while if they displayed their good will in Manchuria, or even in Korea.

40: As to the Original Child that was now born, President Truman summed up the philosophy of the situation in a few words, "We found the bomb" he said "and we used it."

41: Since that summer many other bombs have been "found." What is going to happen? At the time of writing, after a season of brisk speculation, men seem to be fatigued by the whole question.

Merton, Thomas. *The Collected Poems of Thomas Merton*. New York: New Directions, 1977. (pp. 293-302)

VETERANS FOR PEACE NUCLEAR POSTURE REVIEW



January 2022



INTRODUCTION

This January, President Biden is expected to issue a United States Nuclear Posture Review (NPR)ⁱ, prepared by the Department of Defense in a tradition started in 1994 during the Clinton Administration and continued during the Bush, Trump and Obama presidencies.ⁱⁱ Veterans For Peace is concerned that the world is on a downward spiral toward climate catastrophe and our nation increasingly wastes its scarce resources on weapons that are ultimately useless except to line the pockets of the Military-Industrial-Congressional-Intelligence-Media-Academic-Think-Tank Complex (MICIMATT). International security would best be served by committing a World War level of effort to address the climate crisis rather than preparing for every conceivable military threat.

As veterans who have learned the hard way that serving our government is not always serving our country, members of Veterans For Peace may be more likely than most to distrust pronouncements from the so-called "Defense" establishment. We remember the fraudulent use of the Tonkin Gulf incident which victimized so many of us, the WMD hoax preceding the invasion of Iraq, the use of the "bomber gap" of the 1950s and the missile gap of the 1960s to advance the influence of the Military Industrial Complex about which President Eisenhower warned us.

What we need now is a "Nuclear Posture" that enables us to reduce the real risk of nuclear confrontation through accidental launch or miscalculated escalation, and to accelerate a global reduction and rapid elimination of nuclear weapons.

The Defense Department's Nuclear Posture Review is being drafted when international consensus against the existence of such weapons is building, as exemplified in the number of nations which have supported the Treaty on the Prohibition of Nuclear Weapons (TPNW).ⁱⁱⁱ The treaty was passed by the UN General Assembly on July 7, 2017 with 122 nations in favor and one opposed. The US attacked the whole process and organized a boycott of the vote. The Treaty has since been signed by 86 nations and ratified by 57. It entered into force on January 22, 2021.

None of the nuclear-armed states have signed the Treaty, but it provides a process for establishing a time-bound framework for negotiations leading to the verifiable and irreversible elimination of nuclear weapons. It is toward this goal that a sane nuclear posture must lean.

Image Source:

www.statista.com/chart/23288/status-of-un-treaty-banning-nuclear-weapons



THE STATE OF NUCLEAR WEAPONS IN THE WORLD TODAY

There are 14,000 nuclear bombs on the planet today, with 13,000 of them controlled by the US and Russia. The other seven nuclear powers—China, France, UK, India, Pakistan, Israel and North Korea—have little over 1,000 in all.^v It is clear that if we are actually to abolish nuclear weapons, it is up to the US and Russia to take the lead. With a US proposed budget of nearly two trillion dollars in the next 30 years for two new bomb factories, new missiles, planes, submarines, and redesigned warheads, it is clear that the US is not acting in “good faith” for a “cessation of the arms race at an early date” as required by the 1970 Non-Proliferation Treaty (NPT), to which it is a signatory.



*Image Sources:
Shannon N. Kile and
Hans M. Kristensen, Stockholm
International Peace Research
Institute (SIPRI) and US
Department of State.*

The VFP Nuclear Posture Review proposes that the US immediately cease the “nuclear modernization” program and redirect the funds to implement non-carbon, non-nuclear energy systems, reduce the impact of climate change and provide for societal needs. These are called for in the Nuclear Weapons Abolition and Economic and Energy Conversion Act, HR2850.^v

NUCLEAR WEAPONS ON HAIR-TRIGGER ALERT POISED AND READY TO FIRE

The US and Russia each maintain about 900 weapons on hair-trigger alert, mounted on missiles, poised and ready to fire.^{vi} Since the 1950s there have been countless accidents, near misses, airplane crashes carrying nuclear bombs, missing airplanes with nuclear weapons, and nuclear weapons sent to the wrong location - a whole parade of horrible near disasters.^{vii} For example, in the documentary film, *The Man Who Saved the World*,^{viii} Soviet Colonel Stanislav Petrov had been stationed in his Moscow bunker in 1983, monitoring for incoming attacks. He saw some blips on his computer screen that indicated US missiles were coming in for a nuclear attack on Russia. His orders were to fire all the Soviet missiles against major American cities, but he waited. It turned out to be a computer error! In 2007, six US cruise missiles carrying nuclear warheads were mistakenly loaded onto a B-52 bomber in North Dakota and flown to a base in Louisiana. No one realized the bombs were missing for 36 hours!^{ix} We have been surviving on sheer luck.

The VFP Nuclear Posture Review proposes that the US immediately separate all the warheads from their delivery systems, as China already does, and make the world safer from unintended nuclear catastrophe.

THE US NUCLEAR UMBRELLA

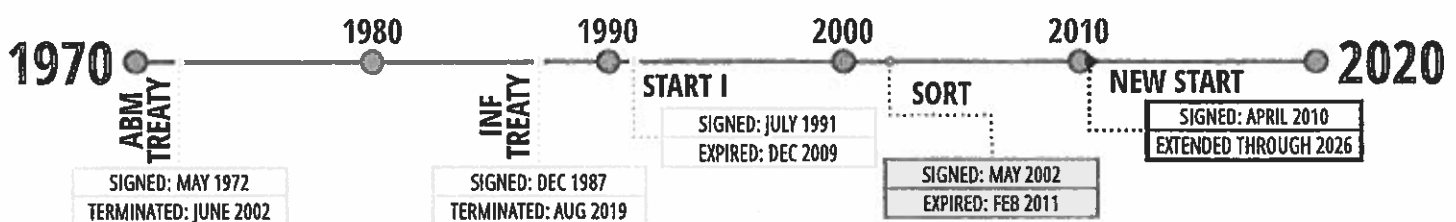
The US offers extended nuclear deterrence to all of its NATO allies, as well as to its Pacific allies Japan, Australia, and South Korea. The US maintains nuclear weapons at bases in five NATO states - Germany, Belgium, the Netherlands, Italy and Turkey. These countries all opposed the establishment of the new Treaty on the Prohibition of Nuclear Weapons (TPNW). Given that Turkey and the US are not as friendly as in the past, one must wonder if it is wise to station nuclear weapons there - or anywhere else. Having nuclear weapons in your country makes you a target - less safe, so it would be better for the host countries to insist that the US remove its nuclear weapons. In fact, in Germany's recent election campaign, the Social Democratic Party (SPD) and the Green Party platforms proposed the removal of the US nuclear bombs from German soil.^x

The VFP Nuclear Posture Review proposes that all US nuclear weapons be removed from other countries.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS RUSSIA

The world has gone from 70,000 nuclear warheads during the height of the Cold War to the 14,000 on the planet today.^{xi} So we do know how to reduce the arsenals by disabling the bombs under strict inspection and verification processes, long established. However, the US has missed numerous opportunities to cooperate with Russia over the years, starting at the end of World War II when President Truman rejected pleas to turn the bomb over to the United Nations under international supervision.^{xii} Subsequent US actions that either missed opportunities to reduce risk or actually increased risk of nuclear confrontation with Russia include the following examples:

- President Reagan rejected President Gorbachev's offer to give up deployment of a Star Wars missile defense system in space as a condition for both countries to eliminate all their nuclear weapons.
- President Clinton refused President Putin's offer to cut our massive nuclear arsenals to 1,500 bombs each,^{xiii} and to call on all of the other nuclear-armed states to negotiate the elimination of all nuclear weapons, in exchange for the US not placing missile sites in Romania.^{xiv}
- President George W. Bush walked out of the 1972 Anti-Ballistic Missile Treaty^{xv} and put a missile base in Romania. President Trump placed another missile base in Poland.
- President Bush in 2008 and President Obama in 2014 blocked any discussion of Russian and Chinese proposals for a space weapons ban in the consensus-bound UN Committee for Disarmament in Geneva.
- President Obama rejected President Putin's offer to negotiate a treaty to ban cyber war.^{xvi,xvii}
- President Trump pulled the US out of the Intermediate-Range Nuclear Forces Treaty.^{xviii}
- From President Clinton through President Biden, the US has never ratified the 1992 Comprehensive Test Ban Treaty, while Russia has ratified it.



US-Russian Nuclear Arms Control Agreements at a Glance

The VFP Nuclear Posture Review recommends reversing these missed opportunities:

Re-implement the Anti-Ballistic Missile Treaty
& eliminate all missile "defense" systems.



Re-implement the Intermediate-Range
Nuclear Forces Treaty.

Ratify the Comprehensive
Nuclear Test Ban Treaty.



Negotiate with Russia to reduce our nuclear arsenals to
1,000 nuclear weapons each & call all the other parties to the
table to negotiate for a treaty to abolish nuclear weapons.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS CHINA

China keeps its approximately 300 nuclear warheads separated from their missiles, a true No First Use posture! Absent serious provocations, China presents no threat of nuclear attack against the US or its allies. However, the US has encircled China with hundreds of military bases and has signaled a commitment to defend Taiwan's independence, counter to previous agreements with China made during the Nixon administration. The US and its corporate media are generating a constant stream of anti-China propaganda, apparently preparing the US public for a possible war with nuclear-armed China.

The current relationship between China and the US is extremely dangerous. Provocative military initiatives and "strategic ambiguity" regarding Taiwan constitute a potentially explosive situation.

The VFP Nuclear Posture Review proposes an immediate halt to US military exercises in the South China Sea. It recommends rescinding the nuclear submarine sales to Australia and other AUKUS military threats to China.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS NORTH KOREA (DPRK)

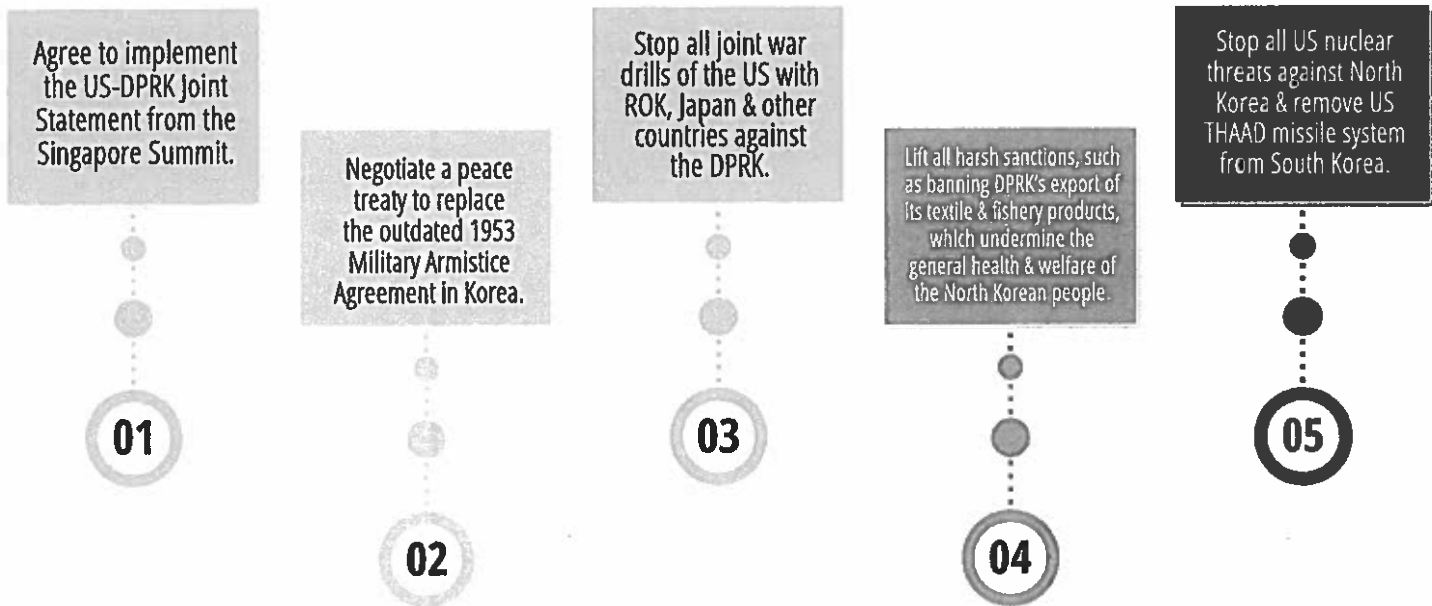
The Democratic People's Republic of Korea (DPRK) has 40 to 50 nuclear warheads.^{xx} On Oct. 14, 2016, the DPRK was the only nuclear-armed country to vote in favor of a resolution of the 1st Committee of the UN General Assembly that proposed a UN conference to negotiate a new treaty to prohibit nuclear weapons.

In 1994 the US and the DPRK signed an "Agreed Framework" - the DPRK would freeze one nuclear research reactor and two nuclear power plants under construction, and re-join the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). In return, the US would provide formal assurances to the DPRK against the threat or use of nuclear weapons, build two nuclear power plants, and provide heavy oil. Both sides promised to "move toward full normalization of political and economic relations." However, the US delayed or refused to implement most of the agreement. The deal failed in 2002 when the US stopped oil shipments and listed the DPRK as a "Rogue Regime" against whom the US might use nuclear weapons.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS NORTH KOREA (DPRK) CONT.

At the US-DPRK Summit in 2018, President Trump and Chairman Kim signed a Joint Statement, which committed to establish new US-DPRK relations, build a peace regime on the Korean Peninsula and work toward denuclearization of the Korean Peninsula. The DPRK destroyed its underground nuclear test site, suspended its nuclear and ICBM missile tests, and started to dismantle the missile site at Dongchangri. But the US merely reduced its US-South Korea joint war drills. At the US-DPRK Summit at Hanoi in 2019, the meeting ended when the US rejected the DPRK's offer to dismantle its nuclear complex at Yongbyon under the watch of American experts, in return for the lifting of 5 of 11 UN sanctions.**

The VFP Nuclear Posture Review proposes the following confidence-building measures be taken first by the Biden administration to revive the US-DPRK talks with the objectives of ending the costly, "forever" US war against the DPRK and achieving nuclear disarmament on the Korean Peninsula in a step-by-step process:



NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS IRAN

President Trump withdrew the United States from the Joint Comprehensive Plan of Action (JCPOA) under which Iran promised to forego enrichment of uranium beyond the level where the material could be used for a bomb, in return for a lifting of US sanctions. Harsh sanctions were then restored on Iran. President Biden has not yet lifted the sanctions, although he says he wants to reinstate the deal, which Iran will not agree to unless sanctions are lifted. Iran voted for the new Treaty for the Prohibition of Nuclear Weapons and participated fully in all the UN negotiations. Iran has no nuclear weapons.

The VFP Nuclear Posture Review proposes that President Biden lift the sanctions against Iran and that the US should re-enter the JCPOA.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS INDIA AND PAKISTAN

The United States needs to understand that no matter what we are doing the rest of the world is watching, wondering how they will be affected, and responding in their own interests. That includes India and Pakistan, two nuclear powers which share a border and have been in conflict over the territory of Kashmir since the 1947 partition of India. Thus any type of intervention by the United States which involves Pakistan or any of the other countries in that region must be considered in the light of its potential to disrupt the fragile peace between India and Pakistan.

The United States must realize that even a limited nuclear exchange between India and Pakistan would create a cloud of dust that would block the sun and could possibly result in a global nuclear winter. A nuclear posture clearly pointed toward the elimination of US nuclear weapons would provide an example to the rest of the world, including India and Pakistan.

The VFP Nuclear Posture Review proposes that the US not engage in alliances such as the "Quad" (Australia, India, Japan and the United States), as they are likely to be perceived as a threat by Pakistan and increase the possibility of a nuclear exchange.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS ISRAEL

Nuclear-armed Israel's belligerent actions and rhetoric toward Iran have only increased during the Biden administration. Israel, Bahrain, United Arab Emirates, and the US recently completed a 2ve-day joint naval exercise in the Red Sea. The uncertain future of the 2015 Iran nuclear deal is another source of tension increasing the risk of an Israeli military attack against Iran. In this environment, the US could find itself drawn into a military confrontation with Iran, with no control over Israel's possible use of nuclear weapons.

The VFP Nuclear Posture Review proposes that President Biden prioritize re-joining the Iran Nuclear Deal, the JCPOA. The US should also actively participate and support the ongoing UN negotiations for a Weapons of Mass Destruction Free Zone in the Middle East, using all available leverage to effect Israel's participation.

NUCLEAR POSTURE CONSIDERATIONS VIS-A-VIS THE UNITED KINGDOM AND FRANCE

United Kingdom

In 1952, the United Kingdom was the third country to develop and test nuclear weapons^{xxi} and is one of the 2ve nuclear-weapon states^{xxii} in the Treaty on the Non-Proliferation of Nuclear Weapons.^{xxiii}

The United Kingdom recently announced that it was increasing the cap on its nuclear stockpile from 225 to 260 warheads. The move largely took nuclear policy experts by surprise. The government explained that the decision to increase its nuclear stockpile for the first time in decades was due to a worsening strategic landscape and technological threats, particularly Russian advances in missile defense and hypersonic weapons. Source: *War on the Rocks*^{xxiv}

United Kingdom Cont.

The decision to boost the number of warheads in its arsenal was not the UK's only major nuclear policy change. The UK stated it would no longer provide specifics about its nuclear stockpile or the conditions under which it would consider nuclear weapons use. In other words, the United Kingdom has now fully committed to a doctrine of strategic ambiguity.

France

France was the fourth country to test an independently developed nuclear weapon, doing so in 1960 under the government of Charles de Gaulle.^{xxv} France currently possesses the world's fourth largest stockpile of operational nuclear weapons. The weapons are part of the national Force de frappe^{xxvi}, developed in the late 1950s and 1960s to give France the ability to distance itself from NATO and exercise its own nuclear deterrence.

On July 10, 1985, two French intelligence operatives sank the flagship of the Greenpeace^{xxvii} fleet, Rainbow Warrior, at the Port of Auckland in New Zealand, on her way to a protest against a planned French nuclear test in Mururoa. Fernando Pereira, a photographer, drowned on the sinking ship.

An appropriate US Nuclear Posture would create conditions under which the UK and France would be more likely to reduce or eliminate their nuclear weapons, whether unilaterally, or in concert with other nuclear-armed nations.

WEAPONIZING SPACE

As the US expands its space operations—the fourth dimension of warfare—the race towards “full spectrum dominance” quickens. Space has long been militarized in the sense that the US uses satellites to guide missiles and aircraft. But the new US doctrine seeks to weaponize space. Today's space power will be harnessed by the US to ensure dominance over the satellite infrastructure that allows for the modern world of internet, e-commerce, GPS, telecommunications, surveillance, and war-fighting.

Since the 1950s, the United Nations has introduced various treaties to prohibit the militarization and weaponization of space—the most famous being the Outer Space Treaty (1967). These treaties aim to preserve space as a commons for all humanity. The creation of the US Space Force is a blatant violation of the spirit, if not the letter, of those treaties. In more recent decades, successive US governments have unilaterally rejected treaties to reinforce and expand the existing space-for-peace agreements.

Source: <https://www.alainet.org/en/articulo/200608>

The VFP Nuclear Posture Review Proposes negotiating an international treaty to plug the gaps of the Outer Space Treaty, such as the Proposed Prevention of an Arms Race in Space (PAROS) Treaty. This would require the prohibition of both weapons in outer space and anti-satellite weapons on Earth.^{xxviii, xvi}

CORRECTING OUR NUCLEAR POSTURE

Unilateral, immediate posture changes to reduce the danger of an unintended nuclear exchange:

1. Announce and implement a No First Use and No Launch on Warning ("Hair Trigger Alert") policy by separating warheads from delivery vehicles. The No First Use Policy should state clearly that the US renounces the use of nuclear weapons, including in response to a cyber attack, biological weapons, chemical weapons, cluster bombs, land mines, or any other non-nuclear act of aggression from another nation against the US or its allies.
2. Decommission ICBM weapons and silos. Since they are well-known, vulnerable targets they can only be used as a first strike weapon.
3. Replace the President's sole authority to launch a nuclear attack with a safer, more collective process less likely to lead to a rash decision.
4. Eliminate THAAD and other anti-ballistic missile systems.

Negotiations for Nuclear Disarmament

5. Sign and ratify the UN Treaty on the Prohibition of Nuclear Weapons.
6. Actively initiate and pursue negotiations to reduce international tensions, promote strategic stability, and prepare the ground for major reduction in nuclear arms.
7. Call all the nuclear states to the table to negotiate a path to nuclear disarmament as required by the 1970 Nuclear Non-Proliferation Treaty.
8. Join with Russia and China in negotiating for space ban and cyber-ban treaties.
9. Ratify the Comprehensive Test Ban Treaty.
10. Re-implement the Anti-Ballistic Missile Treaty and eliminate all missile "defense" systems.
11. Re-implement the Intermediate-Range Nuclear Forces Treaty.

Implementation of Treaty Obligations

12. Work with our allies to remove US nuclear weapons stationed in the NATO countries—Germany, Italy, the Netherlands, Belgium and Turkey.
13. Bring home the submarines carrying nuclear weapons, ground the nuclear bombers, and dismantle the missile sites.
14. Terminate the "nuclear modernization program", including all new nuclear weapons research, design, refurbishment, expansion, laboratory testing and sub-critical testing. Pass the Nuclear Weapons Abolition and Economic and Energy Conversion Act, HR2850^{xxix}.
15. Create adequate funding to clean up uranium mines and mills, nuclear production and testing facilities, and nuclear waste sites in the US and the Pacific nuclear test areas. Develop technologies and facilities for handling radioactive materials.
16. Develop economic conversion plans to help nuclear industry workers make a transition to constructive employment.

CONCLUSION

NUCLEAR DISARMAMENT, NON-INTERVENTION AND CLIMATE JUSTICE GO HAND-IN-HAND

The world is a much more dangerous place with nuclear weapons, particularly given the current confrontations among nuclear-armed nations. The United States military seeks “Full Spectrum Dominance” and the government appears determined to be the preeminent global power, even in the face of diminishing economic power relative to a rising China. It is hard to imagine the US taking serious steps toward nuclear disarmament without a sea change in the thinking among its political elites and real change in its posture toward the rest of the world.

Activist efforts to restrain US militarism and intervention around the globe, to cut the military budget, and to encourage mutual respect and diplomacy among nations must therefore go hand-in-hand with efforts to reduce and eliminate all nuclear weapons.

The Treaty on the Prohibition of Nuclear Weapons (TPNW), which went into effect January 22, 2021, is an historic and extremely important event. It expresses the clear desire of the peoples of the world to be free from nuclear weapons and the threat of a nuclear war that could end human civilization.

The Nuclear Ban Treaty is a valuable tool for education and organizing. Even though the US and other nuclear-armed states have yet to sign on to the TPNW, many cities in the US^{xxx} have passed resolutions in support of signing. New York City is the latest to sign on to the [UN Cities Appeal](#). The US states of California, Oregon, New Jersey and Maine have also passed resolutions in support of the TPNW. Veterans For Peace encourages all of our chapters, members, friends and allies to pursue similar support for the TPNW in their cities.

It is important to build an *intersectional* movement for peace at home and peace abroad. We are engaged in struggles for racial justice, for non-intervention in the affairs of other nations, and for redirecting funds from the military – and nuclear weapons – to healthcare, education and other human rights. We are making common cause with the burgeoning Climate Justice Movement, proclaiming that climate catastrophe and nuclear war are the twin threats to all life on earth.

Our *VFP Nuclear Posture Review* provides a stark contrast to the Nuclear Posture Review being prepared for President Biden by the Pentagon, which will continue to justify the discredited idea of nuclear deterrence, while feeding billions more dollars to nuclear weapons manufacturers. We are providing a well-researched and credible alternative that reflects the global desire for nuclear disarmament and peace. We hope that the *VFP Nuclear Posture Review* will be a guide, a useful tool and an inspiration for all who wish a peaceful future for our children, our grandchildren and generations to come.



Veterans For Peace is a global organization of Military Veterans and allies whose collective efforts are to build a culture of peace by using our experiences and lifting our voices. We inform the public of the true causes of war and the enormous costs of wars, with an obligation to heal the wounds of wars. Our network is comprised of over 140 chapters worldwide whose work includes: educating the public, advocating for a dismantling of the war economy, providing services that assist veterans and victims of war, and most significantly, working to end all wars.

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Signature and ratification status



The Treaty on the Prohibition of Nuclear Weapons opened for signature at the United Nations in New York on 20 September 2017 and entered into force on 22 January 2021.

There are currently 86 signatories and 59 states parties.

SIGNATORY STATES
STATES PARTIES

Algeria	20 September 2017
Angola	27 September 2018
Antigua and Barbuda	26 September 2018
Austria	20 September 2017
Bangladesh	20 September 2017
Belize	6 February 2020

<u>Benin</u>	26 September 2018
<u>Bolivia</u>	16 April 2018
<u>Botswana</u>	26 September 2019
<u>Brazil</u>	20 September 2017
<u>Brunei</u>	26 September 2018
<u>Cabo Verde</u>	20 September 2017
<u>Cambodia</u>	9 January 2019
<u>Central African Republic</u>	20 September 2017
<u>Chile</u>	20 September 2017
<u>Colombia</u>	3 August 2018
<u>Comoros</u>	20 September 2017
<u>Congo Republic</u>	20 September 2017
<u>Costa Rica</u>	20 September 2017
<u>Côte d'Ivoire</u>	20 September 2017
<u>Cuba</u>	20 September 2017
<u>Dominica</u>	26 September 2019
<u>Dominican Republic</u>	7 June 2018
<u>Democratic Republic of the Congo</u>	20 September 2017
<u>Ecuador</u>	20 September 2017
<u>El Salvador</u>	20 September 2017
<u>Fiji</u>	20 September 2017
<u>The Gambia</u>	20 September 2017
<u>Ghana</u>	20 September 2017
<u>Grenada</u>	26 September 2019
<u>Guatemala</u>	20 September 2017
<u>Guinea-Bissau</u>	26 September 2018
<u>Guyana</u>	20 September 2017
<u>Holy See</u>	20 September 2017
<u>Honduras</u>	20 September 2017
<u>Indonesia</u>	20 September 2017
<u>Ireland</u>	20 September 2017
<u>Jamaica</u>	8 December 2017

Kazakhstan	2 March 2018
Kiribati	20 September 2017
Laos	21 September 2017
Lesotho	26 September 2019
Libya	20 September 2017
Liechtenstein	20 September 2017
Madagascar	20 September 2017
Malawi	20 September 2017
Malaysia	20 September 2017
Maldives	26 September 2019
Malta	25 August 2020
Mexico	20 September 2017
Mozambique	18 August 2020
Myanmar	26 September 2018
Namibia	8 December 2017
Nauru	22 November 2019
Nepal	20 September 2017
New Zealand	20 September 2017
Nicaragua	22 September 2017
Niger	9 December 2020
Nigeria	20 September 2017
Palau	20 September 2017
Palestine	20 September 2017
Panama	20 September 2017
Paraguay	20 September 2017
Peru	20 September 2017
Philippines	20 September 2017
Saint Kitts and Nevis	26 September 2019
Saint Lucia	27 September 2018
Saint Vincent and Grenadines	8 December 2017
Samoa	20 September 2017

<u>San Marino</u>	20 September 2017
<u>São Tomé and Príncipe</u>	20 September 2017
<u>Seychelles</u>	26 September 2018
<u>South Africa</u>	20 September 2017
<u>Sudan</u>	22 July 2020
<u>Tanzania</u>	26 September 2019
<u>Thailand</u>	20 September 2017
<u>Timor-Leste</u>	26 September 2018
<u>Togo</u>	20 September 2017
<u>Trinidad and Tobago</u>	26 September 2019
<u>Tuvalu</u>	20 September 2017
<u>Uruguay</u>	20 September 2017
<u>Vanuatu</u>	20 September 2017
<u>Venezuela</u>	20 September 2017
<u>Vietnam</u>	22 September 2017
<u>Zambia</u>	26 September 2019
<u>Zimbabwe</u>	4 December 2020

Further reading:

[Full text of the treaty](#)

[Government positions](#)

[Archive: Negotiation briefings, speeches and other documents](#)

[Photos of the negotiations](#)

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Antigua and Barbuda	25 November 2019
Austria	8 May 2018
Bangladesh	26 September 2019
Belize	19 May 2020
Benin	11 December 2020
Bolivia	6 August 2019

<u>Botswana</u>	15 July 2020
<u>Cambodia</u>	22 January 2021
<u>Chile</u>	
<u>Comoros</u>	19 February 2021
<u>Cook Islands</u>	4 September 2018
<u>Costa Rica</u>	5 July 2018
<u>Cuba</u>	30 January 2018
<u>Dominica</u>	18 October 2019
<u>Ecuador</u>	25 September 2019
<u>El Salvador</u>	30 January 2019
<u>Eiji</u>	7 July 2020
<u>The Gambia</u>	26 September 2018
<u>Guinea-Bissau</u>	15 December 2021
<u>Guyana</u>	20 September 2017
<u>Holy See</u>	20 September 2017
<u>Honduras</u>	24 October 2020
<u>Ireland</u>	6 August 2020
<u>Jamaica</u>	23 October 2020
<u>Kazakhstan</u>	29 August 2019
<u>Kiribati</u>	26 September 2019
<u>Laos</u>	26 September 2019
<u>Lesotho</u>	6 June 2020
<u>Malaysia</u>	30 September 2020
<u>Maldives</u>	26 September 2019
<u>Malta</u>	21 September 2020
<u>Mexico</u>	16 January 2018
<u>Mongolia</u>	10 December 2021
<u>Namibia</u>	20 March 2020
<u>Nauru</u>	23 October 2020
<u>New Zealand</u>	31 July 2018
<u>Nicaragua</u>	19 July 2018
<u>Nigeria</u>	6 August 2020

<u>Niue</u>	6 August 2020
<u>Palau</u>	3 May 2018
<u>Palestine</u>	22 March 2018
<u>Panama</u>	11 April 2019
<u>Paraguay</u>	23 January 2020
<u>Peru</u>	23 December 2021
<u>Philippines</u>	18 February 2021
<u>Saint Kitts and Nevis</u>	9 August 2020
<u>Saint Lucia</u>	23 January 2019
<u>Saint Vincent and Grenadines</u>	31 July 2019
<u>Samoa</u>	26 September 2018
<u>San Marino</u>	26 September 2018
<u>Seychelles</u>	9 July 2021
<u>South Africa</u>	25 February 2019
<u>Thailand</u>	20 September 2017
<u>Trinidad and Tobago</u>	26 September 2019
<u>Tuvalu</u>	12 October 2020
<u>Uruguay</u>	25 July 2018
<u>Vanuatu</u>	26 September 2018
<u>Venezuela</u>	27 March 2018
<u>Vietnam</u>	17 May 2018

Further reading:

[Full text of the treaty](#)

[Government positions](#)

[Archive: Negotiation briefings, speeches and other documents](#)

[Photos of the negotiations](#)

**Bulletin
of the
Atomic
Scientists**

**At doom's doorstep:
It is 100 seconds to midnight**

2022 Doomsday Clock Statement

Science and Security Board
Bulletin of the Atomic Scientists

Editor, John Mecklin

**IT IS 100 SECONDS
TO MIDNIGHT**



It is 100 seconds to midnight

Editor's note: Founded in 1945 by Albert Einstein 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 11 Nobel laureates. The Clock has become a universally recognized indicator of the world's vulnerability to catastrophe from nuclear weapons, climate change, and disruptive technologies in other domains.

To: **Leaders and citizens of the world**
Re: **At doom's doorstep: It is 100 seconds to midnight**
Date: **January 20, 2022**

Last year's leadership change in the United States provided hope that what seemed like a global race toward catastrophe might be halted and—with renewed US engagement—even reversed. Indeed, in 2021 the new American administration changed US policies in some ways that made the world safer: agreeing to an extension of the New START arms control agreement and beginning strategic stability talks with Russia; announcing that the United States would seek to return to the Iran nuclear deal; and rejoining the Paris climate accord. Perhaps even more heartening was the return of science and evidence to US policy making in general, especially regarding the COVID-19 pandemic. A more moderate and predictable approach to leadership and the control of one of the two largest nuclear arsenals of the world marked a welcome change from the previous four years.

Still, the change in US leadership alone was not enough to reverse negative international security trends that had been long in developing and continued across the threat horizon in 2021.

US relations with Russia and China remain tense, with all three countries engaged in an array of nuclear modernization and expansion efforts—including China's apparent large-scale program to increase its deployment of silo-based long-range nuclear missiles; the push by

Russia, China, and the United States to develop hypersonic missiles; and the continued testing of anti-satellite weapons by many nations. If not restrained, these efforts could mark the start of a dangerous new nuclear arms race. Other nuclear concerns, including North Korea's unconstrained nuclear and missile expansion and the (as yet) unsuccessful attempts to revive the Iran nuclear deal contribute to growing dangers. Ukraine remains a potential flashpoint, and Russian troop deployments to the Ukrainian border heighten day-to-day tensions.

For many countries, a huge gap still exists between long-term greenhouse gas-reduction pledges and the near- and medium-term emission-reduction actions needed to achieve those goals. Although the new US administration's quick return to the Paris Agreement speaks the right words, it has yet to be matched with actionable policies.

Developed countries improved their responses to the continuing COVID-19 pandemic in 2021, but the worldwide response remained entirely insufficient. Plans for quick global distribution of vaccines essentially collapsed, leaving poorer countries largely unvaccinated and allowing new variants of the SARS-CoV-2 virus to gain an unwelcome foothold. Beyond the pandemic, worrying biosafety and biosecurity lapses made it clear that the international community needs to focus serious attention on management of the global biological research enterprise. Further, the establishment and pursuit of biological

weapons programs marked the beginning of a new biological arms race.

And while the new US administration made progress in reestablishing the role of science and evidence in public policy, corruption of the information ecosystem continued apace in 2021. One particularly concerning variety of internet-based disinformation infected America last year: Waves of internet-enabled lies persuaded a significant portion of the US public to believe the utterly false narrative contending that Joe Biden did not win the US presidential election in 2020. Continued efforts to foster this narrative threaten to undermine future US elections, American democracy in general, and, therefore, the United States' ability to lead global efforts to manage existential risk.

In view of this mixed threat environment—with some positive developments counteracted by worrisome and accelerating negative trends—the members of the Science and Security Board find the world to be no safer than it was last year at this time and therefore decide to set the Doomsday Clock once again at 100 seconds to midnight. This decision does not, by any means, suggest that the international security situation has stabilized. On the contrary, the Clock remains the closest it has ever been to civilization-ending apocalypse because the world remains stuck in an extremely dangerous moment. In 2019 we called it the new abnormal, and it has unfortunately persisted.

Last year, despite laudable efforts by some leaders and the public, negative trends in nuclear and biological weapons, climate change, and a variety of disruptive technologies—all exacerbated by a corrupted information ecosphere that undermines rational decision making—kept the world

within a stone's throw of apocalypse. Global leaders and the public are not moving with anywhere near the speed or unity needed to prevent disaster.

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.

The nuclear tightrope

During 2021, some nuclear risks declined while others rose. Upcoming decisions on nuclear policies could generate either salutary or dangerous modifications of an already uncertain and worrisome security situation.

The February 2021 agreement between the United States and Russia to renew New START for five years is a decidedly positive development. This extension creates a

window of opportunity to negotiate a future arms control agreement between the two countries that possess 90 percent of the nuclear weapons on the planet. The United States and Russia also agreed to start two sets of dialogues about how to best maintain “nuclear stability” in the future: the Working Group on Principles and Objectives for Future Arms Control and the Working Group on Capabilities and Actions with Strategic Effects. These groups have met and in early 2022 are expected to report on initial results of the consultations, aimed at shaping future arms control agreements.

Another bright spot was the Biden administration's announcements that it would seek to return to the Joint Comprehensive Plan of Action (JCPOA) with Iran and offer to enter strategic stability talks with China. Although

**The world remains stuck
in an extremely
dangerous moment.**

no talks between North Korea and the United States took place in 2021, the North Koreans have not resumed testing of nuclear weapons or long-range intercontinental ballistic missiles (ICBMs). (Tests of shorter-range missiles have continued.) Finally, when the Biden administration began its Nuclear Posture Review (NPR) process, it announced that one specific goal would be to “reduce the role of nuclear weapons” in US national security policy.

Other developments, however, appeared on the negative side of the ledger:

Iran continues to build an enriched uranium stockpile, insisting that all sanctions be removed before returning to talks with the United States on the JCPOA. The window of opportunity seems to be closing. Over time, Iran's neighbors, particularly Saudi Arabia, may feel compelled to acquire similar capabilities, foreshadowing the frightening possibility of a Middle East with multiple countries with the expertise and material to build nuclear weapons.

The Chinese have started to build new ICBM silos on a large scale, leading to concerns that China may be considering a change in its nuclear doctrine. China and Russia have both tested anti-satellite weapons recently, increasing concerns about rapid escalation in any conventional conflict with the United States. Efforts by all three countries to field hypersonic missiles are beginning to yield results, intensifying competition. While experts disagree on both the causes and the consequences of these programs, they clearly mark the start of a new arms competition.

The North Koreans continue to test nuclear-capable short- and medium-range missiles,

including cruise, ballistic, and glide vehicles, and there is evidence of their restarting plutonium production. Meanwhile, there have been no high-level negotiations between the United States and North Korea. India and Pakistan continue to advance their nuclear, missile, and other military capabilities with no diminution of possible flash points that could lead to nuclear conflict.

As the January 6, 2021 insurrection demonstrated, no country is immune from threats to its democracy.

As the January 6, 2021 insurrection at the US Capitol demonstrated, no country is immune from threats to its democracy, and in a state with nuclear-weapons-usable material and nuclear weapons, both can be targets for terrorists and fanatics. Notably, the insurrectionists came close to capturing Vice President Mike Pence and the “nuclear football” that accompanies the vice president as the backup system for nuclear launch commands. More than 10

percent of those charged with crimes during the January 6th insurrection were veterans or active service members. The Pentagon has conducted a major review of extremism in the military and has adopted new definitions of extremist activities in an attempt to reduce this danger in the future. The seriousness of the problem is clear.

Finally, the United States is preparing a Nuclear Posture Review to guide US strategy, policy, and deployments of nuclear weapons, but its overall message appears not yet decided. We hope the document will assert that the United States will reduce the role of nuclear weapons in its deterrence and defense policies, which in turn may positively affect the nuclear weapons postures of other countries, leading, we believe, to a safer world. Where we set the Clock next year will be influenced by what the Nuclear Posture

Review ultimately contains. Reports of congressional interference in the process, resulting in the firing of personnel conducting the review, suggests unwelcome politicization that could well affect the outcome and make more rational nuclear weapons policies hard to effect.

Climate change: Lots of words, relatively little action

This past year's climate negotiations in Glasgow marked an important milestone in climate multilateralism: a critical first round of the treaty's cycle of upgrading national efforts. Countries were under pressure to strengthen their emission-reduction pledges significantly relative to their pledges six years ago in Paris. The results, unfortunately, were insufficient. China and India affirmed that they would move away from use of coal, but only gradually; they affirmed for the first time the objective of achieving "net zero," but only in 2060 and 2070, respectively. There was only partial progress toward defined accounting rules to allow international markets for greenhouse gas emissions and removals to develop. Developed countries again failed to follow through on treaty commitments to provide necessary financial and technological support. Overall, countries' projections and plans for fossil fuel production are far from adequate to achieve the global Paris goals to limit the warming of the surface of the planet to "well below two degrees Celsius" (3.6 degrees Fahrenheit) relative to the temperature around 1800, at the beginning of the industrial revolution.

Encouragingly, several countries (as well as financial institutions and corporations) have announced a commitment to achieve net-zero

carbon dioxide emissions for the long term—meaning by 2050 or thereabouts. These announcements are significant, in that reaching zero aggregate carbon dioxide emissions globally would halt the buildup of greenhouse gas pollution in the atmosphere, which is absolutely critical to halting yet more warming. Earnest efforts to reach these seemingly distant targets require concerted actions in the immediate term, including a redirection of investment away from the production and use of fossil fuel and toward renewables and energy efficiency, massive upgrading of existing infrastructure, and a shift in land use and agriculture practices. The real test of the significance of these net-zero pledges will be whether they are matched by near- and medium-term emission-reduction actions.

Efforts to reach seemingly distant climate targets require concerted actions in the immediate term.

Last year, we noted optimistically the election of a US president who "acknowledges climate change as a profound threat and supports international cooperation and science-based policy," and we've seen a dramatic change in tone from the previous presidential administration.

Recognizing that "[t]he effects we are seeing of climate change are the crisis of our generation," Biden has indeed

attempted to move forward quickly, reentering the United States in the Paris Agreement and announcing the United States' updated Paris emission pledge of a 50 percent reduction by 2030. He has also signaled an attentiveness to the connection between climate action and environmental justice, in both the domestic and international contexts. He has committed to making climate investments in disadvantaged communities within the United States, and at the UN General Assembly meeting he pledged to double climate financing to developing countries.

However, progress achievable through the US political process is highly constrained and fragile, as any subsequent president may try to swing the pendulum backward. The major infrastructure package passed in 2021 is less of a “climate bill” than the Biden administration initially proposed, and the fate of the climate goals of the “Build Back Better” bill hangs in the balance of a starkly divided Congress. It thus is not yet clear how much progress the United States will make in the coming year toward its announced emissions reduction pledge and finance promise.

For over four decades the threat of climate change to “future generations” has been ruefully noted. As warming has continued to drive up temperatures—from an unprecedented extreme high temperature of 100 degrees Fahrenheit in the Siberian Arctic to the record-breaking 2021 “heat dome” over western Canada and the United States—today’s young people are increasingly seeing themselves as the future victims. They are witnessing human and ecosystem tragedies caused, for example, by droughts in eastern Africa and the United States, floods in China and Europe, and wildfires raging around the world, harbingers of yet more dire consequences as climate change accelerates in their lifetimes.

The experience of a deepening crisis has animated protests and other civil society expressions of alarm this year. These have occurred at major political events (such as the G7 Summit), by youth climate movements (such as the student-led Fridays for Future protests around the world), at September’s Climate Week in New York, at COP26 in Glasgow, and at individual sites of proposed new fossil fuel infrastructure (such as Line 3 in the United States, the Trans Mountain Pipeline

in Canada, and the EACOP pipeline in Uganda and Tanzania). These actions focus public attention on climate change and raise its political salience, but whether they will transform policies, investments, and behaviors remains among the most important questions facing global society.

The burgeoning biological threat to civilization

For years, the United States and many other countries underinvested in defense against natural, accidental, and intentional biological threats. They also underestimated the impacts that a biological threat could have on the

entire world. COVID-19 revealed vulnerabilities in every country and the world’s collective ability to prepare for, respond to, and recover from infectious disease outbreaks.

The COVID-19 pandemic rightly has absorbed the world’s attention, given its demonstrated ability to sicken and kill millions, weaken national economies and global supply chains, and destabilize governments and societies. And yet,

what the world has experienced during this pandemic is nowhere close to a worst-case scenario.

To deal with the crisis at hand, the world is focusing almost all its efforts on COVID-19, to the exclusion of other biological threats. The scope of potential biological threats is expansive. Preventing and mitigating future biological events will require a wider lens for viewing biological threats. For example, slow vaccination rates have allowed virus mutations, perpetuating the threat from COVID-19. Similarly, failing to address antibiotic resistance could trigger a worldwide

What the world has experienced during this pandemic is nowhere close to a worst-case scenario.

pandemic involving antimicrobial-resistant organisms within a decade. Research into novel diseases has proliferated high-containment laboratories around the world. Some of those labs inadvertently release pathogens into the environment. Some regimes to monitor and regulate these laboratories are perceived by their researchers to be excessively burdensome and restrictive. At the same time, the Biological Weapons and Toxin Convention still struggles to find effective ways to enforce its prohibitions on the development and production of biological agents and weapons.

This year, the US Department of State declared that Russia and North Korea possess active biological weapons programs and expressed concern about dual-use biological research programs in China and Iran. Terrorist organizations such as Al Qaeda and ISIS and some criminal organizations continue to profess their determination to build, acquire, and use biological weapons to achieve their goals. The globally inadequate response to COVID-19 only serves to underscore that an attack using a weapon containing biological agents designed to resist existing medical countermeasures could provide attackers with some of the tactical, operational, strategic, and economic advantages they seek. The US Department of Defense is now concerned enough about that prospect to undertake a biological posture review.

The world now lives in an age of biological innovation. Many countries and corporations are making enormous investments in biological science, biotechnology, and combinational science and technology (in which biology combines with other fields), recognizing that they have immense opportunities to establish and grow bio-economies. Innovative biological research and development efforts simultaneously increase and decrease biological risk. The field is moving quickly.

CRISPR-Cas9, the revolutionary genetic engineering tool that scientists in the United

States and Sweden discovered in 2012, is cheap and ubiquitous today, spurring investments in genetic testing and adult stem cell technologies. Countries and non-state actors are exploring ways to create super-soldiers, personalize medicine, increase human performance, improve human gene therapy, and synthesize biology. Innovations such as synthetic biology have created new areas of discovery, outpacing current public health, safety, and security measures.

The world is failing to recognize the multifaceted nature of the biological threat. Advances in biological science and technology can harm us as well as help us. Leaders must recognize that COVID-19 is not the last biological threat we will have to face in our lifetimes—or, perhaps, even this year.

Disruptive technology in the age of disinformation

The new US administration has done much to reestablish the role of scientists in informing public policy, and even more to minimize deliberate confusion and chaos emanating from the White House. Thoughtful deliberation—merely a promise in January 2021—appears to be realized more often today. On the other hand, disinformation fomented outside the executive branch—including from some members of Congress and many state leaders—appears to have taken root in alarming and dangerous ways.

Large fractions of Congress and the public continue to deny that Joe Biden legitimately won the presidential election, and their views on these matters appear to be hardening rather than moderating. Similar trends regarding COVID-related disinformation are apparent around the world, crippling the ability of public health authorities and medical science to achieve higher vaccination rates. Mask-wearing and social distancing are similarly discouraged by disinformation. While we know more now about the role of social media campaigns in taking advantage of vulnerabilities in human psychology and

cognition to spread disinformation and societal disunity, the behavior of social media companies has changed hardly at all. Political attacks on institutions that provide societal continuity and store hard-won knowledge about how best to deal with problems continue apace.

In cyber conflict, cyberattackers have grown more audacious. The SolarWinds hack, an attack on Microsoft Exchange that affected millions around the world, and a ransomware attack on Colonial Pipeline (resolved only with the payment of \$4.4 million to get the system up and running again) all demonstrate the far-reaching ramifications of cyber-vulnerabilities.

The good news in cyber includes a Biden executive order and other federal government initiatives on cybersecurity that seem to have significant force and momentum behind them and have gone farther than previous orders and initiatives. The expert cybersecurity team the new administration has assembled has the ear of the president. In addition, against all odds, both the UN Open-Ended Working Group and the Group of Government Experts have reached some rough consensus on cyber norms of behavior. (The first group involves representatives from most of the world's nations; the latter includes the biggest players in cyber.) It remains to be seen whether these norms actually affect the behavior of national actors in cyberspace, but it is better to have these norms in place (or in the process of being formed and agreed to) than not to have them at all.

It also appears that Chinese use of surveillance technology has reached new heights in Xinjiang in the last year. Artificial intelligence and facial recognition systems intended to reveal states of emotion have been tested on Uyghurs in Xinjiang. In the last year, it has also come to light that China is seeking to develop standards for using facial recognition that can be optimized for distinguishing individuals by ethnic group. The potential widespread deployment of these technologies presents a

distinct threat to human rights around the world and, therefore, civilization as we know and practice it.

Finally, tensions over military space activity have increased in the past few years. For example, Russia conducted an anti-satellite missile test in November, destroying one of its own satellites and creating a debris cloud that orbited dangerously close to the International Space Station. Russia has also "injected an object into orbit" that subsequently approached another

Russian satellite already in orbit in a manner consistent with its use as an anti-satellite weapon. A similar activity has been used to follow a US government satellite. Press reports have suggested that US Space Command is on the verge of disclosing a new anti-satellite weapon. On the other hand, US officials from the State and Defense departments were reported to be drafting language for a binding UN resolution regarding responsible behavior in space. If approved, such language could reduce the likelihood of space incidents taking place.

The potential widespread deployment of these technologies presents a distinct threat to human rights around the world and, therefore, civilization as we know and practice it.

Practical steps to move the world away from catastrophe and toward a safer world


Last year, we looked forward to the end of the COVID-19 pandemic—but that end is not yet in sight. Leaders in the wealthiest and most advanced countries have not acted with the speed and focus necessary to manage dire threats to humanity's future.

Our decision to keep the Doomsday Clock at 100 seconds to midnight is a clear warning to the world: We need to back away from the doorstep of doom. Immediate, practical steps to protect humanity from the major global threats that we have outlined are needed:

- The Russian and US presidents should identify more ambitious and comprehensive limits on nuclear weapons and delivery systems by the end of 2022. They should both agree to reduce reliance on nuclear weapons by limiting their roles, missions, and platforms, and decrease budgets accordingly.
- The United States and other countries should accelerate their decarbonization, matching policies to commitments. China should set an example by pursuing sustainable development pathways—not fossil fuel-intensive projects—in the Belt and Road Initiative.
- US and other leaders should work through the World Health Organization and other international institutions to reduce biological risks of all kinds through better monitoring of animal-human interactions, improvements in international disease surveillance and reporting, increased production and distribution of medical supplies, and expanded hospital capacity.
- The United States should persuade allies and rivals that no-first-use of nuclear weapons is a step toward security and stability and then declare such a policy in concert with Russia (and China).
- President Biden should eliminate the US president's sole authority to launch nuclear weapons and work to persuade other countries with nuclear weapons to put in place similar barriers.
- Russia should rejoin the NATO-Russia Council and collaborate on risk-reduction and escalation-avoidance measures.
- North Korea should codify its moratorium on nuclear tests and long-range missile tests and help other countries verify a moratorium on enriched uranium and plutonium production.
- Iran and the United States should jointly return to full compliance with the Joint Comprehensive Plan of Action and initiate new, broader talks on Middle East security and missile constraints.
- Private and public investors should redirect funds away from fossil fuel projects to climate-friendly investments.
- The world's wealthier countries should provide more financial support and technology cooperation to developing countries to undertake strong climate action. COVID-recovery investments should favor climate mitigation and adaptation objectives across all economic sectors and address the full range of potential greenhouse gas emission reductions, including capital investments in urban development, agriculture, transport, heavy industry, buildings and appliances, and electric power.
- National leaders and international organizations should devise more effective regimes for monitoring biological research and development efforts.
- Governments, technology firms, academic experts, and media organizations should

cooperate to identify and implement practical and ethical ways to combat internet-enabled misinformation and disinformation.

- At every reasonable opportunity, citizens of all countries should hold their local, regional, and national political officials and business and religious leaders accountable by asking “What are you doing to address climate change?”

Without swift and focused action, truly catastrophic events—events that could end civilization as we know it—are more likely. When the Clock stands at 100 seconds to midnight, we are all threatened. The moment is both perilous and unsustainable, and the time to act is now. 

Science and Security Board Biographies

Rachel Bronson is the President and CEO of the Bulletin of the Atomic Scientists, where she oversees the publishing programs, the management of the Doomsday Clock, and activities around nuclear risk, climate change, and disruptive technologies. Before joining the Bulletin, she served as vice president for Studies at The Chicago Council on Global Affairs, adjunct professor of “Global Energy” at the Kellogg School of Management, and senior fellow and director of Middle East studies at the Council on Foreign Relations, among other positions. Her book, *Thicker than Oil: America’s Uneasy Partnership with Saudi Arabia* (Oxford University Press, 2006), has been translated into Japanese and published in paperback. Her writings and commentary have appeared in outlets including *Foreign Affairs*, *Foreign Policy*, *The New York Times*, *The Washington Post*, “PBS NewsHour,” and “The Daily Show.” Bronson has served as a consultant to NBC News and testified before the congressional Task Force on Anti-Terrorism and Proliferation Financing, Congress’s Joint Economic Committee, and the 9/11 Commission.

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.

Lynn Eden Eden is Senior Research Scholar (Emeritus) at Stanford University’s Center for International Security and Cooperation. Eden is also co-chair of US Pugwash and a member of the International Pugwash Council. Her scholarly work focuses on the military and society; science, technology, and organizations; and US nuclear weapons history and policy. Eden’s *Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation* won the American Sociological Association’s 2004 Robert K. Merton award for best book in science and technology studies. Her current research and writing asks how a specific US military planning organization has enabled very good people to plan what, if put into action, could or would result in the deaths of tens or hundreds of millions of people. In other words, how do US military officers make plans to fight and prevail in nuclear war? The answer lies not in individual psychology but in common organizational processes such as abstraction, categorization, and fragmented responsibilities.

Rod Ewing is the Frank Stanton Professor in Nuclear Security in the Center for International Security and Cooperation in the Freeman Spogli Institute for International Studies and a Professor in the Department of Geological Sciences in the School of Earth, Energy and Environmental Sciences at Stanford University. Ewing’s research focuses on the back end of the nuclear fuel cycle, mainly nuclear materials and the geochemistry of radionuclides. He is the past president of the International Union of Materials Research Societies. Ewing has written extensively on issues related to nuclear waste management and is co-editor of *Radioactive Waste Forms for the Future and Uncertainty Underground: Yucca Mountain and the Nation’s High-Level Nuclear Waste*. He received the Lomonosov Medal of the Russian Academy of Sciences in 2006.

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

Biographies (cont.)

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 and Leo Szilard Lectureship awards, the Federation of American Scientists' Hans Bethe 'Science in the Public Service' award, and the Secretary of Defense Medal for Outstanding Public Service.

Asha M. George is the executive director of the Bipartisan Commission on Biodefense. 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. 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.

Daniel Holz (Co-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. 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 co-chair of the Science and Security Board, Holz is a member of the Governing Board, *ex officio*.

Sivan Kartha is a senior scientist at the Stockholm Environmental Institute whose research and publications for the past 25 years have focused on technological options and policy strategies for addressing climate change, concentrating most recently on equity and efficiency in the design of an international climate regime. He is a co-leader of SEI's Gender and Social Equity Programme, and co-director of the Climate Equity Reference Project. His current work deals primarily with the economic, political, and ethical dimensions of equitably sharing the effort of an ambitious global response to climate change. Dr. Kartha has also worked on mitigation scenarios, market mechanisms for climate actions, and the environmental and socioeconomic impacts of biomass energy. His work has enabled him to advise and collaborate with diverse organizations, including the UN Climate Convention Secretariat, various United Nations and World Bank programs, numerous government policy-making bodies and agencies, foundations, and civil society organizations throughout the developing and industrialized world. He served as a coordinating lead author in the preparation of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, released in 2014, co-leading the chapter on Equity and Sustainable Development, and has been selected as a lead author for the upcoming IPCC Sixth Assessment Report, to be released in 2021.

Biographies (cont.)

Robert Latiff retired from the US Air Force as a major general in 2006. He is an adjunct professor at the University of Notre Dame and a research professor at George Mason University's School of Engineering. He is also a member of the Intelligence Community Studies Board and the Committee on International Security and Arms Control of the National Academies of Sciences, Engineering, and Medicine. Latiff's new book, *Future Peace: Technology, Aggression, and the Rush to War*, 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*.

Herb Lin is a senior research scholar for cyber policy and security at the Center for International Security and Cooperation, and Hank J. Holland Fellow in Cyber Policy and Security at the Hoover Institution, both at Stanford University. His research interests relate broadly to the policy and national security dimensions of cybersecurity and cyberspace, with focus on offensive operations in cyberspace and information warfare and influence operations. Lin holds additional affiliations with the National Academies, Columbia's Saltzman Institute, and the Aspen Cybersecurity Group. In 2019, he was elected a fellow of the American Association for the Advancement of Science. In 2016, he served on President Obama's Commission on Enhancing National Cybersecurity. He has previously served as a professional staff member and staff scientist for the House Armed Services Committee (1986-1990), where his portfolio included defense policy and arms control issues.

Suzet McKinney is the Principal and Director of Life Sciences for Sterling Bay where she oversees relationships with the scientific, academic, corporate, tech, and governmental sectors involved in the life sciences ecosystem. She also leads the strategy to expand Sterling Bay's footprint in life sciences nationwide. She previously served as CEO and Executive Director of the Illinois Medical District, where she managed a 24/7/365 environment that included 560 acres of medical research facilities, labs, a biotech business incubator, universities, raw land development areas, four hospitals and more than 40 healthcare related facilities. In 2020, Dr. McKinney was

appointed by Illinois Governor JB Pritzker as Operations Lead for the State of Illinois' Alternate Care Facilities, a network of alternate medical locations designed to decompress the hospital system during the COVID-19 pandemic. Dr. McKinney holds her Doctorate degree from the University of Illinois at Chicago School of Public Health and received her Bachelor of Arts in Biology from Brandeis University. She received her Master of Public Health degree and certificates in Managed Care and Health Care Administration from Benedictine University in Lisle, IL.

Steve Miller is Director of the International Security Program at the Belfer Center for Science and International Affairs in Harvard University's Kennedy School of Government. He is a Fellow of the American Academy of Arts and Sciences, where he is a member of the Committee on International Security Studies (CISS). Miller is also Co-Chair of the US Pugwash Committee, and is a member of the Council of International Pugwash. Miller co-directed the Academy's project on the Global Nuclear Future Initiative with the *Bulletin's* former Science and Security Board chair, Robert Rosner.

Raymond Pierrehumbert is Halley Professor of Physics at the University of Oxford. He was a lead author on the IPCC Third Assessment Report, and a co-author of the National Research Council report on abrupt climate change. He was awarded a John Simon Guggenheim Fellowship in 1996, which was used to launch collaborative work on the climate of Early Mars with collaborators in Paris. He is a Fellow of the American Geophysical Union (AGU), a Fellow of the American Academy of Arts and Sciences, and has been named Chevalier de l'Ordre des Palmes Académiques by the Republic of France. Pierrehumbert's central research interest is the use of fundamental physical principles to elucidate the behavior of the present and past climates of Earth and other planets, including the growing catalog of exoplanets. He leads the European Research Council Advance Grant project EXOCONDENSE.

Robert Rosner is the William E. Wrather Distinguished Service Professor in the Departments of Astronomy & Astrophysics

Biographies (cont.)

and Physics, and the Harris School of Public Policy at the University of Chicago. Rosner served as Director of Argonne National Laboratory, where he had also served as Chief Scientist. His current scientific research is mostly in the areas of laboratory and astrophysical fluid dynamics and magnetohydrodynamics, and computational physics. His policy-oriented work has focused on the future of nuclear power and the back end of the nuclear fuel cycle, as well as various aspects of electrifying the transport sector. He is a fellow of the American Physical Society, and an elected member of the American Academy of Arts & Sciences and the Norwegian Academy of Science and Letters. Rosner was chair of the Science and Security Board from 2013-2021.

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.

Robert Socolow is professor emeritus in the Department of Mechanical and Aerospace Engineering at Princeton University. 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.

Susan Solomon is the Lee and Geraldine Martin Professor of Environmental Studies at the Massachusetts Institute of Technology and was the Founding Director of the MIT Environmental Solutions Initiative from 2014-2015. She is well known for pioneering work that explained why there is a hole in the Antarctic ozone layer and is the author of several influential scientific papers in climate science. Solomon received the Crafoord Prize from the Swedish Academy of Sciences in 2018, the 1999 US National Medal of Science, the nation's highest scientific award, in 1999, and has also received the Grande Medaille of the French Academy of Sciences, the Blue Planet Prize in Japan, the BBVA Frontiers of Knowledge Award, and the Volvo Environment Prize. She is a member of the US National Academy of Sciences, the French Academy of Sciences, and the Royal Society in the UK. She served as co-chair for the Intergovernmental Panel on Climate Change (IPCC) fourth climate science assessment report, released in 2007. *Time* magazine named Solomon as one of the 100 most influential people in the world in 2008.

Sharon Squassoni (Co-Chair) is a research professor at the Institute for International Science and Technology Policy, Elliott School of International Affairs, at the George Washington University. She has specialized in nuclear nonproliferation, arms control and security policy for three decades, serving in the US government at the Arms Control and Disarmament Agency, the State Department, and the Congressional Research Service. Since 2007, she has directed research programs at the Center for Strategic and International Studies and the Carnegie Endowment for International Peace. A political scientist by training, she holds degrees from the State University of New York at Albany, the University of Maryland, and the National War College. As co-

Biographies (cont.)

chair of the Science and Security Board, Squassoni is a member of the Governing Board, *ex officio*.

Jon Wolfsthal is is Director of the Nuclear Crisis Group, an independent project of Global Zero. Wolfsthal served previously as Special Assistant to the President of the United States for National Security Affairs and senior director at the National Security Council for arms control and nonproliferation. During his time in government, he was involved in almost every aspect of US nuclear weapons, arms control, nonproliferation and security policy. Previously, Wolfsthal was the Deputy Director of the Center for Nonproliferation Studies at the Monterey Institute of International Studies, and served for three years as special advisor to Vice President Biden on issues of nuclear security and nonproliferation. He served in several capacities during the 1990s at the US Department of Energy, including an on-the-ground assignment in North Korea during 1995-96. With Joseph Cirincione, he is the author of *Deadly Arsenals: Tracking Weapons of Mass Destruction*. Wolfsthal is a non-resident fellow with the Carnegie Endowment for International Peace.

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.

Biographies (cont.)

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 manmade threats to our existence. The Bulletin focuses on three main areas: nuclear risk, climate change, and disruptive technologies. 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; policymakers, 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 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 Doomsday Clock changes


 **2021 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.

 **2020 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—closer to apocalypse than ever. In so doing, board members are explicitly warning 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.


 **2019 IT IS STILL 2 MINUTES TO MIDNIGHT** The “new abnormal” that we describe, and that the world now inhabits, is unsustainable and extremely dangerous. The world security situation can be improved, if leaders seek change and citizens demand it. 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 use the power of the Internet to fight against social media disinformation and improve the long-term prospects of their children and grandchildren. They 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.


 **2018 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. It is two minutes to midnight, but the Doomsday Clock has ticked away from midnight in the past, and during the next year, the world can again move it further from apocalypse. The warning the Science and Security Board now sends is clear, the danger obvious and imminent. The opportunity to reduce the danger is equally clear. 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 insist on facts, and discount nonsense. They can demand action to reduce the existential threat of nuclear war and unchecked climate change. They can seize the opportunity to make a safer and saner world.


 **2017 IT IS TWO AND A HALF MINUTES TO MIDNIGHT** For the last two years, the minute hand of the Doomsday Clock stayed set at three minutes before the hour, the closest it had been to midnight since the early 1980s. 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. It is two and a half minutes to midnight, the Clock is ticking, global danger looms. 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.


Timeline (cont.)


 **2016 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.”


 **2015 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, and world leaders have failed to act with the speed or on the scale required to protect citizens from potential catastrophe. These failures of political leadership endanger every person on Earth.” 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.”

 **2012 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.

 **2010 IT IS 6 MINUTES TO MIDNIGHT** International cooperation rules the day. Talks between Washington and Moscow for a follow-on agreement to the Strategic Arms Reduction Treaty are nearly complete, and more negotiations for further reductions in the U.S. and Russian nuclear arsenal are already planned. Additionally, Barack Obama becomes the first U.S. president to publicly call for a nuclear-weapon-free world. The dangers posed by climate change are still great, but there are pockets of progress. Most notably: At Copenhagen, the developing and industrialized countries agree to take responsibility for carbon emissions and to limit global temperature rise to 2 degrees Celsius.


 **2007 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.


 **2002 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.


 **1998 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


Timeline (cont.)

examples to the rest of the world. Together, they still maintain 7,000 warheads ready to fire at each other within 15 minutes.


 **1995 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 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.


 **1991 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.


 **1990 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.

 **1988 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 U.S. nuclear weapons in Western Europe inspires it. For years, such intermediate-range missiles had kept Western Europe in the crosshairs of the two superpowers.


 **1984 IT IS 3 MINUTES TO MIDNIGHT**
U.S.-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.


 **1981 IT IS 4 MINUTES TO MIDNIGHT**
The Soviet invasion of Afghanistan hardens the U.S. 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.


 **1980 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.'"

Timeline (cont.)


 **1974 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 (MIRV), both countries can now load their intercontinental ballistic missiles with more nuclear warheads than before.


 **1972 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.


 **1969 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 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. U.S. 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 non-stop 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

Timeline (cont.)

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.