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Future Weapons of Mass Destruction

A Joint Symposium by The Stanley Foundation and the Potomac Institute for Policy Studies

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The 20th century walked a well-trodden path for each of the current categories of weapons of mass destruction (WMD)—nuclear, chemical, biological, and radiological. Albeit at varying speeds and not necessarily in a straight progression, this lifecycle passes through the phases of conception, invention, development, deployment, stockpiling, stigmatization, rules creation, limitation framework development, stockpile reduction, and, theoretically at least, destruction. These phases can be more fully defined as (with accompanying analogues in the US nuclear realm):

- **Conception.** The creative process that foresees new processes building on the underlying existing knowledge base or that considers developed technologies in new and inventive manners and contexts (Einstein's letter to President Franklin Delano Roosevelt)

- **Invention.** The transformation of conception into physical, if prototypical, form (Trinity, Little Boy, Fat Man)

- **Development.** Qualitative improvements in weapons design, increased focus on delivery systems, beginning of doctrine integration (hydrogen bomb)

- **Deployment.** The regularization and institutionalization of weapons, delivery system(s), infrastructure, and doctrine into military planning (Mk-3, Mk-4)

- **Stockpiling.** The industrialization of weapons programs and the associated quantitative buildup of weapons and related assets (>3,000 W76 warheads)

- **Stigmatization.** Military, political, and public assessments of negative characteristics of weapons start to factor into doctrine and decision making (Hiroshima, Cuban Missile Crisis, MAD)

- **Rules creation.** National and international limitations on doctrine, development, or stockpiling of weapons or related assets ("nuclear football," SALT)

- **Limitation framework development.** Initial rules creation is refined, codified, and enhanced, likely with international actors participating in monitoring and verification (START, IAEA Additional Protocol)

- **Stockpile reduction.** Either due to independent action or within the requirements of international agreements, quantitative reductions are made in weapons, delivery systems, or infrastructure. May or may not be accompanied by qualitative (e.g., doctrinal) reductions (Trident)

- **Destruction.** The physical demolition/dismantlement of weapons, delivery systems, and/or infrastructure. Knowledge base is likely maintained, but scale of weaponization process allows meaningful verification of destruction to be possible (Peacekeeper retirement)

Will this century witness a similar inventive pursuit of new types of WMD, perhaps along similar lifecycle paths? Several factors point to the affirmative. The human desire to push the boundaries of knowledge has not diminished and a number of potential pathways toward new forms of WMD have begun to emerge. Globalization and the rate of technological evolution in today's world have dramatically changed the rules of the game. Scientific knowledge and expertise are spreading to all corners of the globe; the infrastructure needed to create, stockpile, and employ WMD may become more difficult to detect and prevent. Smaller groups and nonstate actors now play a growing role in international political affairs. Our mechanisms for limiting or preventing proliferation and enforcing international standards are decreasing in their effectiveness; the need, not just to redouble our efforts but reconceptualize our modes of thinking in these areas, is becoming increasingly clear.

While some particular lines of investigation have already been opened (e.g., nanotechnology), and certain audiences have already begun to consider their potential use, ethical concerns, or strategic impact (i.e., the defense research and development agencies and the niche media), little cross-cutting dialogue has brought the divergent areas together for comprehensive consideration. Yet such a conversation is needed in order to foster further consideration among and across experts, including technocrats, military strategists, philosophers, arms control experts, sociologists, and political leaders.

In an attempt to understand and positively influence future development of these potentially existential threats, a wise beginning might be to survey both the current and foreseeable future landscapes, analyze past lessons, and then project analogous nascent permutations into future scenarios. One means of accomplishing this would be to bring together practitioners, academics, and policymakers to consider the directionalities and implications of these confluences on defense and international security policy.

In December 2006, the Stanley Foundation and the Potomac Institute for Policy Studies brought together such a group. Over the course of the day, participants discussed the potential development and consequences of "future weapons of mass destruction" from three distinct vectors—technical, strategic, and ethical—in an attempt to capture perspectives from the hard sciences, the social sciences, and philosophical human endeavors. We present this summary brief as an invitation to break from the current and historical strictures imposed on thinking surrounding longstanding, mature WMD lines and to consider potential long-range impacts of today's cutting-edge technology and political environments.

A Preliminary Definitional Discussion

An interesting, overarching line of discussion ran throughout the symposium. *Weapons of mass destruction*, as an umbrella term, is often definitionally enlarged or constricted, depending on the situation and context, but it is useful to engage in a brief consideration of how and why we define *WMD* as we do. The current *American Heritage New Dictionary of Cultural Literacy* (Third Edition), defines *WMD* as "[w]eapons that can produce devastating results when delivered in a single strike." Wikipedia offers "a term used to describe a massive weapon with the capacity to indiscriminately kill or incapacitate. The phrase broadly encompasses several areas of weapon synthesis, including nuclear, biological, chemical (NBC) and, increasingly, radiological weapons."[1] Combining these with a survey of the literature reveals some common characteristics: (1) a weapon that causes massive casualties and/or physical devastation; (2) a characteristic indiscriminate nature; (3) a compositional make-up that is beyond conventional explosives; and (4) a defined categorization of particular weapons conforming to these traits—nuclear, chemical, biological, and radiological.

As we look to the future, there is rising interest in separating the *methods* of achieving these characteristics from the *results* themselves. Historically, the focus has been on the method, leading to a strict categorization of WMD (and a continual discussion over how narrowly to draw those lines) of specific technologies. However, as technologies advance, as information and capabilities expand, and as potential power diffuses to broader and smaller subsets of actors, it may be more useful to consider WMD from the perspective of results. In short, what "weapons" (i.e., able to inflict massive, indiscriminate casualties and/or devastation) may develop, shift, and/or mutate, depending on circumstances

and opportunity? Flexibility in defining *WMD* may lead to better understanding and abilities to adapt to new challenges. When the malfunction of an electric substation creates a ripple effect that cuts off power to the entire US Northeast and when malicious computer code can cripple the Internet providers who provide access to the Internet for millions of users, perhaps *disruption* may be a more suitable term than *destruction*; maybe the definition of *weapon* needs to be rethought.

An attack that disrupts a society's infrastructure and sows chaos within the society will have greater consequences as the global community becomes increasingly complex and interdependent. Future adversaries will likely be able to take advantage of this progressively varied menu of WMD as "social" WMD promises to reap larger havoc for a smaller cost than traditional WMD.

During World War II, the firebombing of European cities and the atomic bombings in Japan normalized the practice of attempting to destroy the will and resources of a society during wartime, not simply the military of the enemy state. According to this rationale, the ultimate consequences of WMD will best be measured equally in terms of survivors and victims, as domestic survivors' experiences and fears disproportionately influence domestic and international security policy.

As a consequence, threat and risk analyses play an increasingly important role as the WMD threat diversifies into innumerable possibilities from wide-ranging sectors including satellite communications and neurotechnology—the convergence of nanotechnology, biotechnology, and information technology. In order to utilize defense resources most efficiently, it is necessary to analyze which envisioned future weapons and technologies are most likely to come to fruition; a new field of computational societal dynamics using computer simulations that can model these non-linear transitions may assist risk analysts.

Balancing the need to defend against existing threats with the need to research and develop defenses against these possible future threats will be a challenge for international defense policy and the defense budget. After the bombing of Pearl Harbor, the United States worked diligently to fortify its harbors against any type of attack. Again, after September 11, 2001, the United States has made considerable efforts to mitigate the risk of terrorist attacks occurring through our air system. Is preventing another 9/11 the most pragmatic way to utilize US defense resources?

Technical Issues

Pure and applied science, engineering, and overall technical advancement are the most likely pathways toward the development of future types of WMD. Furthermore, new confluences or juxtapositions of existing technologies may contribute to new types of weapons or new dispersion methods. For this reason, one symposium panel was dedicated to the discussion of technical issues and their implications.

Until recently, strategic analysts forecast the development of technology as a linear path, with nanotechnology and info-technology leading to biotechnology, which would then lead to the advancement of nanobiotechnology and neurotechnology. However, as a function of our postmodern, synthesizing experience, technology is now moving in a more compressed, non-linear manner with rapid and simultaneous developments across subject areas.

Technological advances in the next decades will be driven not simply by new developmental vistas of invention and convergence but also by sociopolitical trends, such as the next "Age Wave" in the United States and other post-industrialized countries. As the percentage of the working population drops precipitously, new technologies that aid in the care and support of the aging population will be in high demand. Much of this biotechnology—including disease detection/prevention, injury healing, and disability reduction—will have weapons applications.

As an example, new scientific breakthroughs in the understanding of the human body are one likely basis for new WMD. WMD could utilize the new discoveries in the mechanisms of the neuro-spectrum, including the functions of stress, trauma, attention, sleep, peer pressure, decision making, learning, trust, and religious feeling, whether to extend and enhance the quality of life or to create more warfighting capabilities.

Although many conference participants emphasized the vast number of new technologies that could be weaponized, they also stressed the importance of developing more advanced, effective mechanisms for choosing *which* technologies

represent the greatest threat. Technologies that are most likely to be weaponized include:

- Robotics (small, cheap, mobile robots that utilize swarm behavior) Reconnaissance, Surveillance, and Target Acquisition (RSTA) and attack ops, sensors, and weapons on the battlefield.

- Hypersonics and stealth.

- Directed beams as weapons for defense and offense; e.g., lasers, high-powered microwave (HPM), and particle beams.

Strategic Implications: Defense, Deterrence, and Coalitions

The second symposium panel dealt with the strategic considerations regarding potential new forms of WMD, from development to dissuasion. Technical potentials without implementation remain just that—potential. The way in which states choose to direct and react to developments in future WMDs may greatly impact the global security environment of the coming decades. Whether or not the traditional cycle of the existing WMDs will be perpetuated in future cases or whether decision makers can chart a new course is a central question.

The United States has traditionally utilized overlapping strategies of defense, deterrence, military force, and coalitions to manage WMD threats. The United States' strategic posture is still based on World War II and Cold War thinking, assuming that identifiable and discrete entities that can be traced to sovereign actors constitute the greatest threat to the United States. The assumption that all transnational and international groups or individuals are politically and materially equipped by an identifiable military state leads to a national security strategy which seeks to prepare the United States' military to fight and win wars.

Sixteen years on, Cold War assumptions—particularly the continued commitment to large-scale offensive platforms supporting a conventional triad of land, air, and water power-projection—still garner the lion's share of military doctrine and funding. Notwithstanding this entrenched system, realities on the ground such as globalization, the rise of nonstate actors, instability in the global system, and the growing influence of domestic constituencies have changed the concept of international security and how to achieve it. Rather than largely cohesive state actors, both individuals and mass social movements—such as radical Islam—have shown that the United States can no longer rely on Cold War ideology. Clinging to a Cold War-era security paradigm does not prepare the United States to analyze or deal effectively with these new threats.

Technical experts agree that it is a nontrivial challenge to assess the technological advances most likely to be weaponized or pose a threat to national security. From a strategic angle however, while offensive weapons are based on new technologies, defensive strategies often rely far more heavily on the architecture of security policy and agreements rather than on actual weaponry. Therefore, although new technologies and weapons development will continue to challenge efforts to curb the WMD threat, a flexible international nonproliferation regime and other international arrangements will still constitute an important portion of the US security posture.

In the past, international agreements have been legally binding in theory but difficult to maintain in practice, when they lack sufficient formal structures for enforcement and implementation. This failure to agree and implement consequences and repercussions seriously limits the utility of such agreements. Furthermore, ongoing political disagreements on the nature of compliance (for instance, the state of compliance of the United States and the other nuclear weapon states vis-à-vis their Article VI obligations within the Nuclear Non-Proliferation Treaty) and on the underlying philosophies surrounding the role of formal multilateral agreements in achieving US security create instability and uncertainty.

The nonstate actor phenomenon is most-often recognized among potential threat-sets: terrorists and those who actively or passively support them. A second, indicative perspective on the growing influence of nonstate actors is to recognize the continued and expanding sway of domestic determinants. Particularly important in fractionated, multistate democracies where strong minority opinions can create and break domestic coalitions, interest groups play larger roles than in the past. As an example, the European Union may decide on a particular policy, but whether or not individual governments can persuade their citizens may ultimately determine actual implementation. This power shift may lead to greater accountability, responsiveness, and transparency within governments; it is certainly a widening departure from past practices that warrants further examination on the impacts it will have on the international security environment.

Ethical Considerations

Ethics in international security are often relegated to secondary tiers of consideration. Yet for a variety of reasons, there may be diminishing utility in such approaches. First, as General David Petraeus, commander of Multinational Force Iraq wrote to US troops in May 2007, "Our values and the laws governing warfare teach us to respect human dignity, maintain our integrity, and do what is right. Adherence to our values distinguishes us from our enemy."[2] Second, a clear ethical articulation that is widely accepted among our friends and allies bolsters our support and increases our ability to lead others. Finally, in an era of worldwide instant communication, actions widely perceived as breaches in ethics will be used by our foes as propaganda to inflame larger and more ardent opposition to our policies.

But there are other wrinkles to the ethical component of future WMD issues. The United States has the tendency to exhibit a parochial absolutism that only seriously considers those positions that can be understood through our outlook and perspective. If the United States continues to resist serious analysis of Islamic fanaticism, with a presumption that it is unintelligible through the US worldview, the United States may fail to address the concerns and problems that make Islamic fanaticism attractive to very large immigrant populations in the Western world and populations in the Middle East and Asia.

Moreover, recent political discourse has demonstrated an increased political, if not popular, acceptance of preventive actions to mitigate threats. In his 2002 West Point commencement address, President George W. Bush stated, "If we wait for threats to fully materialize, we will have waited too long."[3] The 2002 National Security Strategy elaborated this position, stating, "We must be prepared to stop rogue states and their terrorist clients before they are able to threaten or use weapons of mass destruction against the United States and our allies and friends."[4] Under the preventive discourse, a foreign government is effectively forced to prove its innocence or else be considered guilty, in sharp contrast to the American domestic legal system. In the 2003 case of Iraq and Saddam Hussein, it became incumbent on Hussein to show how and where his WMD were destroyed and to be entirely cooperative and transparent in facilitating inspections. His defiance in the face of these demands gave room for international suspicion and doubt, making international intervention more acceptable from the standpoint of the United States and its allies.

Conclusion

At the Stanley Foundation/Potomac Institute conference, experts and strategists painted a disturbing picture of the future of WMD: countless new technologies with the potential to be weaponized converging with political and strategic trends that bend toward capability dispersion and sometimes chaos. But such dystopian fears should not lead to deterministic thinking. The major powers of the 20th century were the prime creators and movers behind the development, deployment, and regularization of the current forms of WMD; they undoubtedly will play a major role on all sides of the issue for future WMD—creating, dissuading, promoting, preventing, embracing, and proscribing.

It has been said that if you don't know where you're going, any road will get you there. Recent experiences with agenda-setting initiatives for corollary technology-based fields (e.g., stem cell research, genetically modified foods) reveal significant challenges to long-term policy planning, but also point out considerable level of interest and engagement, particularly once an issue moves beyond the purely theoretical and into the realistically potential. Further comparative analysis across these fields may lead to the outlining of successful strategies for future WMD thinking.

Endnotes

[1] *http://en.wikipedia.org/wiki/Weapons_of_Mass_Destruction*.

[2] *http://www.mnf-iraq.com/images/stories/CGs_Corner/values_message_%2810_may_07%29.pdf*.

[3] "President Bush Delivers Graduation Speech at West Point," United States Military Academy, West Point, New York, *http://www.whitehouse.gov/news/releases/2002/06/20020601-3.html*.

[4] The National Security Strategy of the United States of America, *http://www.whitehouse.gov/nsc/nss.pdf*.

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The Potomac Institute for Policy Studies

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